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CONTENTS *for* MARCH 1940

Extent and Causes of Differences in Hourly Earnings	*Jacob Perlman*	1
The Minimum Wage and Employment in the Seamless Hosiery Industry	*A. F. Hinrichs*	13
The Problem of our Excessive Banking Reserves	*Lawrence H. Seltzer*	24
Actuarial Problems in Social Insurance	*Reinhard A. Hohaus*	37
Statistical Methods as Applied to Casualty Insurance	*Mark Kormes*	47
Mortality Tables—Financial Measuring Rods in Life Insurance	*A. N. Guertin*	55
Standard Classification of Industries in the United States	*V. S. Kolesnikoff*	65
An Industrial Classification for Reports from Individuals	*Bruno Fels and P. K. Whelpton*	74
Plans for Vital Statistics in 1940	*Halbert L. Dunn*	86
The Analysis of Economic Time Series	*Gerhard Tintner*	93
Practical Difficulties Met in the Use of Experimental Designs	*A. E. Brandt*	101
The Uses of the Census of Business	*Paul T. Cherington*	107
Notes (See Table of Contents)		116
Proceedings of the 101st Annual Meeting		147
Book Reviews (See Table of Contents)		181

VOLUME 35 NUMBER 209 PART I

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Extent and Causes of Differences in Hourly Earnings . JACOB PERLMAN 1
Effects of the 25-Cent Minimum Wage on Employment in the Seamless Hosiery Industry . . . . . A. F. HINRICHS 13
The Problem of our Excessive Banking Reserves . . . . . LAWRENCE H. SELTZER 24
Actuarial Problems in Social Insurance . . . REINHARD A. HOHAUS 37
Statistical Methods as Applied to Casualty Insurance . MARK KORMES 47
Mortality Tables—Financial Measuring Rods in Life Insurance . . . . . ALFRED N. GUERTIN 55
Standard Classification of Industries in the United States . . . . . VLADIMIR S. KOLESNIKOFF 65
An Industrial Classification for Reports from Individuals . . . . . BRUNO FELS and P. K. WHELPTON 74
Plans for Vital Statistics in 1940 . . . . . HALBERT L. DUNN 86
The Analysis of Economic Time Series . . . . GERHARD TINTNER 93
Practical Difficulties Met in the Use of Experimental Designs . . . . . A. E. BRANDT 101
The Uses of the Census of Business . Summary by PAUL T. CHERINGTON 107

NOTES

Statistical News and Notes
Studies of the Temporary National Economic Committee . . . . . THEODORE J. KREPS 116
Central Statistical Board 117
The 1940 Census of Population 117
Bureau of Labor Statistics, U. S. Department of Labor 119
Women's Bureau, U. S. Department of Labor 120
Bureau of Research and Statistics, Social Security Board 121
Research and Statistics Division, Bureau of Employment Security, Social Security Board 124
Bureau of Old-Age and Survivors Insurance, Social Security Board . . 125
Office of Education 126
Division of Research, Work Projects Administration, Federal Works Agency 127
United States Department of Agriculture 127
Commodity Exchange Administration 128
Board of Governors of the Federal Reserve System 129
Securities and Exchange Commission 130
Division of Tax Research, U. S. Treasury Department 131
United States Tariff Commission 132
Bituminous Coal Division, Department of the Interior 133
Bureau of Statistics, Interstate Commerce Commission 133
Dominion Bureau of Statistics, Canada 133
Dun & Bradstreet, Inc. 135
National Bureau of Economic Research, Inc. 136
National Industrial Conference Board, Inc. 137
Investigations of the Twentieth Century Fund 137
Chapter Activities 138
New Members 146

PROCEEDINGS OF THE 101ST ANNUAL MEETING

Program of the Annual Meeting 147
Minutes of the Annual Business Meeting 156
Reports of Officers, Committees, and Representatives
Board of Directors 158
Secretary 161
Treasurer 161
Auditing Committee 162

Continued on next page

PROCEEDINGS (*Continued*)

Census Advisory Committee 166
Joint Committee on Metropolitan Districts 168
Committee on Census Enumeration Areas 168
Joint Committee on Occupational Classification 169
Joint Committee on Relief Statistics 171
Committee on Statistics of Institutions for Mental and Physical Disorders 171
Committee on Statistics of Delinquents and Criminals 173
Joint Committee on Income Tax Statistics 173
Joint Committee for the Development of Statistical Applications in Engineering and Manufacturing 174
Social Science Research Council, 1938–39 174
List of Committees and Representatives for 1939 177

BOOK REVIEWS

BINDER, PAUL. *Die Schalthebel der Konjunktur.* Otto Nathan 190
BRESSLER, RAYMOND G., JR., and HOPKINS, JOHN A. *Trends in Size and Production of the Aggregate Farm Enterprise, 1909–36.* Roland S. Vaile 194
BRINTON, WILLARD C. *Graphic Presentation.* Morton S. Nagelberg . . . 185
BUROS, OSCAR KRISEN. Editor. *Research and Statistical Methodology: Books and Reviews, 1933–1938.* Harold A. Phelps 185
COWLES COMMISSION FOR RESEARCH IN ECONOMICS. *Report of the Fifth Annual Research Conference on Economics and Statistics.* O. J. McDiarmid 187
DAVIS, JOSEPH S. *On Agricultural Policy, 1926–1938.* E. J. Working . . 197
DE BERNONVILLE, LÉO DUGÉ. *Initiation a L'analyse Statistique.* Max Sasuly 183
GOULDEN, C. H. *Methods of Statistical Analysis.* S. S. Wilks 181
GRAY, CLARENCE T., and VOTAW, DAVID F. *Statistics Applied to Education and Psychology.* Martin F. Fritz 184
HERRMANN, HELEN. *Ten Years of Work Experience of Philadelphia Machinists.* V. O. Watts 192
HOPKINS, JOHN A., see Bressler, Raymond G., Jr.
HOPKINS, JOHN A., see Shaw, Eldon E.
HOYT, HOMER. The Structure and Growth of Residential Neighborhoods in American Cities. Malcolm J. Proudfoot 205
LEAGUE OF NATIONS. *World Economic Survey, Eighth Year, 1938–39.* Charles S. Tippetts 191
LEAGUE OF NATIONS. *World Production and Prices, 1938–39.* Charles S. Tippetts 191
MOORE, JANE. *Cityward Migration: Swedish Data.* W. Lewis Abbott . . 207
NEIFELD, M. R. *Personal Finance Comes of Age.* Rolf Nugent 202
NETHERLANDS CENTRAL STATISTICAL OFFICE. *The Influence of Prices on Exports.* Carel Jan Smit 189
PALMER, GLADYS L. *Ten Years of Work Experience of Philadelphia Weavers and Loom Fixers.* V. O. Watts 192
PALMER, GLADYS L., and STOFLET, ADA M. *The Labor Force of the Philadelphia Radio Industry in 1936.* V. O. Watts 192
PALMER, GLADYS L., and WILLIAMS, CONSTANCE. *Reemployment of Philadelphia Hosiery Workers after Shutdowns in 1933–34.* V. O. Watts . . 192
POOLE, KENYON E. *German Financial Policies 1932–1939.* S. J. Mushkin . 201
SHAW, ELDON E., and HOPKINS, JOHN A. *Trends in Employment in Agriculture, 1909–36.* Roland S. Vaile 194
SMITH, JOHN H. *Tests of Significance, What They Mean and How to Use Them.* Harry Schwartz 182
SNIDER, JOSEPH L, *Credit Unions in Massachusetts.* William B. Jensen . . 204
STANFORD UNIVERSITY. *Wheat Studies of the Food Research Institute.* Theodore Norman 196
STOFLET, ADA M., see Palmer, Gladys L.
TINBERGEN, J. *Statistical Testing of Business-Cycle Theories, Volume II: Business Cycles in the United States of America 1919–1932.* Wilbert G. Fritz 186
VOTAW, DAVID F., see Gray, Clarence T.
WILLIAMS, CONSTANCE, see Palmer, Gladys L.

Publications Received 209

PART 2

PROCEEDINGS OF THE CENTENARY CELEBRATION

JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION

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EXTENT AND CAUSES OF DIFFERENCES IN HOURLY EARNINGS*

By Jacob Perlman
Chief, Division of Wage and Hour Statistics
U. S. Bureau of Labor Statistics

Prior to the N.R.A., it was customary to look upon the wage structure largely from the standpoint of a single establishment. This is the point of view of the personnel manager and efficiency engineer, whose task is to devise a wage scale that will accomplish primarily the following: First, with due regard to existing competitive rates in the labor market, attract to the plant the necessary supply and quality of workers; and, second, promote efficiency and satisfaction among the members of the labor force within the establishment, thereby keeping down production costs.

Since 1933, however, the emphasis has shifted to a consideration of the wage structure from the national standpoint. This is due to the efforts of the Government to regulate wages on a national basis, first under the codes of the N.R.A. and at present under the provisions of the Public Contracts and Fair Labor Standards Acts. The parties interested in the operation of these laws have come to recognize that the large number of differences found in a national wage structure express certain more or less defined relationships. They have also realized that the setting of minimum wages may affect these relationships in one way or another with respect to wages and employment.

There is considerable speculation as to the effect a given minimum might have upon the wage structure and employment in an industry, due largely to the lack of comprehensive information on the subject. On the other hand, owing to wage surveys in numerous industries during recent years, which have been made by both private and Governmental agencies, there are abundant data available as to the nature of the relationships that explain existing differences in the national wage structure. The object of this paper is to summarize briefly the more important of these relationships, which should be considered in setting minimum wages in the various industries.

* A paper presented at the 101st Annual Meeting of the American Statistical Association, Philadelphia, December 30, 1939.

WAGE RATES VERSUS HOURLY EARNINGS

The only practical way to measure the differences in a wage structure is to use hourly earnings instead of wage rates. Of course, the latter may be obtained for workers paid on a straight-time basis. However, there are numerous employees in industry engaged on straight-piece work or paid under various production bonus plans, for whom the basic or guaranteed rates are no indication of the hourly earnings. On the other hand, the hourly earnings may be obtained for each individual by dividing the total hours actually worked into his total earnings for a given pay-roll period.

It may also be argued as to whether or not the hourly earnings computed should take into account certain deductions[1] or non-productive bonuses.[2] The same applies to penalty rates paid for overtime work. The inclusion of these items gives actual hourly earnings rather than those that are due primarily to the productive effort of the employees. However, while such deductions or additions may affect considerably the hourly earnings of certain individual workers, they amount to very little when distributed over the large group of employees. Since there is hardly any difference between the results obtained by the two methods on a wide basis, it is probably better to use actual hourly earnings rather than those based only on productive effort.

INDUSTRY APPROACH TO STUDY OF WAGE STRUCTURE

In studying the national wage structure, the most common approach has been from the standpoint of a single industry. This was done under the codes of the N.R.A., and the same procedure is now being followed in connection with the Public Contracts and Fair Labor Standards Acts. Thus, it is assumed that each industry has its own wage structure, which may be distinguished from those of other industries.

There is no doubt that in numerous instances it is possible to talk of an industry wage structure. This may be seen from an analysis of the distribution by average hourly earnings of individual plants. In a number of industries, the distribution not only covers a relatively narrow range but it also discloses a well defined modal concentration. These characteristics are quite often indicative of the operation of economic competition, which has produced similarities among the wage structures of the various establishments in the industry. Such an industry usually has numerous plants, which are fairly well concentrated geographically. Moreover, it is one in which the labor cost per unit of output is an important element in the price of the product.

By contrast, there are cases where no industry wage structure may

[1] These include penalties for spoilage, breakage, etc.

[2] Exclusive of perquisites, the value of which is very often hard to determine.

be said to exist. The distribution of plant averages in such an industry covers a wide spread, with no well defined modal concentration. This kind of an industry quite often has a relatively small number of establishments, which are scattered widely on a regional basis. Furthermore, the labor cost per unit of output may be relatively small. Under such conditions, the wage structure in a given plant is largely the result of competition from establishments of other industries in the same locality, with the competition from other plants in the same industry located elsewhere playing a fairly minor rôle.

In other words, it is my opinion that, in studying the wage structure of a given industry, more attention should be given than in the past to inter-industry differences in hourly earnings. Such an approach would help toward a better understanding of the national wage structure.

DIFFERENCES BY PRODUCT IN WAGE STRUCTURE

One factor that often contributes to the wide dispersion in the average hourly earnings of individual plants in a given industry is the fact that it covers a number of products, each of which is represented by its own wage structure. This is a question of industry definition, which should be investigated very closely beforehand, as it may be necessary to divide the industry into branches and treat each one separately.

A good illustration of this kind is found in connection with the hosiery industry, which has been treated until recently by various Government agencies as a single entity. As a matter of fact, this industry consists of two distinct branches, one covering full-fashioned and the other seamless hosiery. These divisions differ from each other in numerous respects, such as manufacturing processes, composition of labor force, geographical distribution, size of establishment, and degree of unionization. Moreover, a recent survey of the industry by the Bureau of Labor Statistics showed that each branch had a totally different wage structure, as indicated by the fact that the average hourly earnings of all workers amounted to 65.8 cents for full-fashioned and 35.1 cents for seamless hosiery.

Another illustration is the electrical manufacturing industry, which covers an enormous variety of products. In a recent survey of this industry, it was necessary to break it down into 14 separate divisions, each of which had a different wage structure. The average hourly earnings of all employees among the various branches ranged from 49.5 cents for fuses, wiring devices and specialty transformers to 86.2 cents for transformers and switchgear. These differences were due primarily to variations in the composition of the labor force as to sex and skill. Thus, the lowest-paid divisions were those that operated on a mass-

production basis and had a relatively large proportion of semiskilled workers and females, while the highest-paid branches had a relatively large proportion of skilled males.[3]

VARIATIONS IN HOURLY EARNINGS DUE TO METHODS OF WAGE PAYMENT

Another factor responsible for differences in hourly earnings among workers in the same plant, as well as among various establishments in a given industry, is the method of wage payment used, such as straight-time rates, straight-piece rates, and the various production bonus plans in operation.

The dispersion in hourly earnings among workers is especially wide in industries with a large proportion of the labor force paid on a straight piece-rate basis. This is true of employees in the same sex and occupation. In a certain boot and shoe factory, for example, a survey by the Bureau of Labor Statistics in 1939 showed that the earnings of 26 male machine shoe cutters varied from 42.3 to 81.1 cents an hour, with the average amounting to 64.3 cents. In the same plant, the hourly earnings of 43 female fancy stitchers ranged from 30.0 to 53.4 cents, the average being 35.9 cents. This wide dispersion reflects to a large extent differences in the productive capacity of individual workers.

Similarly, there is considerable variation in hourly earnings among workers paid under production bonus plans. For the most part, such methods of wage payment are found in plants belonging to the large industrial corporations, and to a certain degree this accounts for the difference in hourly earnings in favor of the large as against the small companies. Moreover, the production bonuses are often responsible for the relatively high hourly earnings of individual semiskilled and unskilled workers in certain industries.

Moreover, the methods of wage payment based on measured production generally result in higher hourly earnings than are found under straight-time rates. With few exceptions, this was true of workers in the set-up and folding paperbox industries surveyed in 1935. In the set-up paper box industry, for example, the hourly earnings of females operating automatic wrapping machines in the northern region amounted to 39.6 cents under straight-time rates, 41.9 cents under straight-piece rates, and 44.0 cents under production bonus systems.[4] In the folding paper box industry, taking the hourly earnings of male press feeders in the northern area, the figures amounted respectively to 49.3, 55.3, and 53.5 cents.[5]

[3] See *Monthly Labor Review*, July 1939, pp. 176–177.
[4] U. S. Department of Labor, Bureau of Labor Statistics, Bulletin No. 633, p. 56.
[5] U. S. Department of Labor, Bureau of Labor Statistics, Bulletin No. 620, p. 45.

GEOGRAPHICAL DIFFERENCES

Of the various factors that play an important part in the wage structure, the geographical one has received without doubt the greatest attention during recent years. As regards Government regulation, regional variations in wages were recognized in the codes of the N.R.A., which generally set separate minima for the northern and southern states. Likewise, geographical differences are now taken into consideration in setting minimum rates under the provisions of the Public Contracts Act. Lastly, the existence of regional variations has been one of the difficulties encountered in making wage determinations above the 30-cent minimum in connection with the Fair Labor Standards Act.

It should be pointed out at the outset that from all available evidence, relatively few states constitute homogeneous wage areas. In many industries, the various states usually show two or more contrasting wage levels. For example, in the State of Indiana, wages in the northern part are on the whole considerably higher than those in the southern section. The same thing is true of Pennsylvania, which shows the highest hourly earnings in the Pittsburgh territory, or fairly high level in the metropolitan area of Philadelphia, with the lowest wages in the small towns of the southeastern part of the State. Hence, any regional classification of hourly earnings must be made without regard to state lines.

In industries that are widely distributed geographically, the hourly earnings are considerably lower in the southern as against the northern states. However, hourly earnings also vary within each group of states, although these differences are usually less pronounced. One way of characterizing the regional variations in hourly earnings is by distinguishing between the northern and southern wage plateaus, with each one containing numerous elevations and depressions.

There are a number of reasons for the considerably lower wage level found in the southern as compared with the northern states. One of these is the traditional lag in wages that has existed in the South for a long time. But more important than this is the fact that, unlike the northern states, the South is on the whole very little unionized, possesses relatively few large communities, and has industries in which the large companies do not predominate, each of which factors tends to contribute to higher hourly earnings. Moreover, in contrast to many of the northern states, the southern region is still primarily agricultural with an abundant supply of cheap labor eager to serve industry.

Owing to the fact that the situation changes from one industry to another, it is not easy to divide the northern states into homogeneous wage areas. In general, northern New England has lower hourly earn-

ings than southern New England. Moreover, wages in southern Pennsylvania, Maryland, and Delaware are considerably below those in New York, New Jersey, and northern Pennsylvania. On the whole, hourly earnings are high in the middlewestern states of Ohio, Michigan, Indiana, Illinois, Wisconsin, Minnesota, and the urban areas of Missouri. The wage level lags considerably throughout the agricultural belt comprising the Dakotas, Nebraska, Kansas, and Iowa. On the other hand, hourly earnings are higher in most of the mountain states, while one of the highest wage levels is found on the Pacific Coast.

In the southern states, hourly earnings are on the whole relatively higher among those in the outer belt, including Virginia, North Carolina, Kentucky, Tennessee, Oklahoma, and Texas. By contrast, they are fairly low in the states of the deep South, which includes South Carolina, Georgia, Florida, Alabama, Mississippi, Arkansas, and Louisiana.

VARIATIONS BY SIZE OF COMMUNITY

Some attention has also been given in recent years to differences in hourly earnings by size of community.[6] Various wage surveys, however, have indicated that these differences are more important than it has been considered.

The extent to which hourly earnings vary by size of community may be seen from data covering the meat-packing industry in 1937. In the northern wage district, if places with a population of under 25,000 are excluded, the average of all workers increased gradually with the size of community, the range being from 61.8 cents for places between 25,000 and 50,000 to 69.9 cents for metropolitan areas of 1,000,000 and over. The relatively high average in communities below 25,000 is due for the most part to the high wage level in one large establishment. In the southern wage district, the average hourly earnings were considerably higher in metropolitan areas between 100,000 and 500,000 than in places under 100,000. Moreover, the differences in hourly earnings by size of community are still prominent when the figures are also broken down by size of company, which is another important factor affecting wages in this industry. This is shown by the data for the northern region, for which the coverage is sufficiently large to present a simultaneous breakdown by size of community and size of company. (See Table 1.)[7]

Another illustration is found in connection with the boot and shoe

[6] By size of community is meant here the population of the metropolitan area, which includes a central city and the suburban districts, as defined by the Bureau of the Census. It should be pointed out that considerable confusion will result in the analysis if it is based on size of city, including merely the population within the political boundaries, rather than size of community.

[7] See *Monthly Labor Review*, October 1939, pp. 948–951.

TABLE 1

AVERAGE HOURLY EARNINGS OF MEAT-PACKING WORKERS IN THE NORTHERN WAGE DISTRICT, BY SIZE OF COMMUNITY AND TYPE OF PLANT, DECEMBER 1937

(Source: Bureau of Labor Statistics)

Size of community	"Big Four" companies			Intermediate companies			Small companies		
	Number of plants	Number of workers	Average hourly earnings	Number of plants	Number of workers	Average hourly earnings	Number of plants	Number of workers	Average hourly earnings
All communities	51	23,810	$0.715	16	9,055	$0.636	151	10,852	$0.597
Under 50,000	4	2,006	.649	4	3,012	.682	32	1,807	.540
50,000 to 100,000	4	2,062	.688	3	1,928	.614	10	664	.540
100,000 to 500,000	15	4,279	.711	3	1,096	.642	36	2,780	.565
500,000 to 1,000,000	10	5,255	.720	3	1,482	.597	17	781	.557
1,000,000 and over	18	10,208	.734	3	1,537	.628	56	4,820	.653

industry, for which figures are available for 1939. In this industry, the average hourly earnings of all workers in the country as a whole varied directly with size of community almost without exception. In rural territory (below 2,500), the average was 37.3 cents, as compared with 56.5 cents in metropolitan areas with a population of 1,000,000 and over. This is a difference of as much as 19.2 cents. There was very little difference in hourly earnings between places of 2,500 and under 5,000 and those of 5,000 and less than 10,000, both averaging about 41 cents. On the other hand, each succeeding class of size of community showed an increase in the average over the preceding class. Furthermore, the differences in hourly earnings by size of community are important even when the figures are broken down by unionization and the retail price of shoes, which are the other two important factors in the wage structure. (See Table 2.)[8]

Among other reasons differences in hourly earnings by size of community have been justified on the basis of variations in cost of living. Although the information on inter-community differences in cost of living is limited, it appears that the differences in hourly earnings in most cases are relatively much larger than those in cost of living.

DIFFERENCES BY SIZE OF COMPANY

For a long time, it has been generally understood that the larger companies paid higher wages than the smaller firms. This is confirmed by a number of recent surveys. Moreover, it appears that the differences in hourly earnings by size of company[9] are fairly well pronounced,

[8] U. S. Department of Labor, Bureau of Labor Statistics, Bulletin No. 670, pp. 19–23 and 31–33.

[9] In the illustrations used in this article, size of company is defined in terms of number of the employees, but it may be measured in other ways, such as value of product, physical output, etc. It is important to point out that much better results are obtained in an analysis based on size of company rather than size of establishment, due to the fact that quite often a large company has several plants, some of which may be relatively small and have the same wage level as the large establishments.

TABLE 2

AVERAGE HOURLY EARNINGS OF WORKERS IN PLANTS MANUFACTURING BOOTS AND SHOES ONLY, BY SIZE OF COMMUNITY, UNIONIZATION, AND RETAIL PRICE OF SHOES, FIRST QUARTER OF 1939

(Source: Bureau of Labor Statistics)

Size of community and unionization	Total	Under $2.50	$2.51–$4.50	$4.51–$7.50	Over $7.50
Total	$0.488	$0.441	$0.475	$0.526	$0.587
Union plants	.538	.497	.493	.547	.622
Nonunion plants	.462	.431	.468	.505	.510
Under 20,000	.416	.375	.427	.471	*
Union plants	.410	*	.400	*	—
Nonunion plants	.417	.374	.433	.464	*
20,000 and under 100,000	.478	.446	.505	.473	.472
Union plants	.484	—	*	.493	*
Nonunion plants	.476	.446	.512	.460	*
100,000 and under 1,000,000	.516	.470	.518	.544	.608
Union plants	.542	.489	.544	.539	*
Nonunion plants	.500	.466	.497	.550	*
1,000,000 and over	.571	.517	.526	.575	.642
Union plants	.587	.523	.543	.579	.650
Nonunion plants	.528	.510	*	*	*

* Figure omitted, owing to coverage including either less than 3 companies or 1 firm sufficiently large to dominate the data when there are 3 or more companies.

which means that this factor deserves greater consideration than has been given to it in the past.

One of the industries in which size of company dominates the wage structure is that engaged in the manufacture of soap. According to a survey by the Bureau of Labor Statistics made in 1938, the average hourly earnings of all workers in this industry amounted to 76.2 cents for the large concerns, which may be compared with 58.0 cents for the medium-sized and 55.6 cents for the small companies. In other words, whereas there was relatively little difference in the wage level between the medium- and small-sized concerns, a considerable variation existed between the large and other companies.

As indicated previously, size of company is an important factor in the wage structure of the meat-packing industry. In the latter, however, the hourly earnings varied in accordance with 3 groups of concerns, namely the "Big Four," intermediate, and small companies. For all workers in the entire country the averages in 1937 amounted to 70.1 cents for the "Big Four," 63.6 cents for the intermediate, and 56.2 cents for the small concerns. In the northern wage district, the respective average hourly earnings were 71.5 cents, 63.6 cents, and 59.7 cents. In the southern wage district, the "Big Four" averaged 58.0

cents, as compared with only 41.8 cents for the other companies. Similar differences were found when the figures were analyzed separately for each sex-skill group. Moreover, the variations by size of company were also important when the data were broken down in the northern wage district by size of community, which is the other important factor in the industry's wage structure. (See Table 1.)

In addition to soap and meat packing, pronounced variations in hourly earnings by size of company were disclosed by surveys of the Bureau of Labor Statistics in the radio, electrical manufacturing, explosives, fertilizers, and iron and steel industries. It will be observed that in each of these industries several large concerns dominate the field.

One of the reasons for the higher hourly earnings in the larger as against the smaller companies has already been mentioned, namely the fact that a greater proportion of the former as compared with the latter have production bonus plans. However, there may be other important reasons, one being the desire to obtain the highest grade of workers in the labor market. Moreover, due to the greater economies and efficiency generally prevailing in the large companies, they are quite able to pay higher wages than their competitors.

DIFFERENCES BETWEEN TRADE-UNION AND NON-TRADE-UNION PLANTS

It is a well-known fact that some of the highest wages in this country are found in industries that have a high degree of unionization. A number of surveys, however, have disclosed that unionization is also a factor in certain of the less organized industries, where in most cases the hourly earnings in trade-union exceed those in non-trade-union plants.[10]

For example, variations in hourly earnings between trade-union and non-trade-union establishments were disclosed by a survey of the Bureau of Labor Statistics in the furniture industry in 1937. Among the several divisions of the wood household branch, the differences in the averages of all workers in the northern region amounted to 7.8 cents for case goods, 15.3 cents for upholstered furniture, 6.7 cents for novelty furniture, and 13.8 cents for kitchen furniture. Similar variations were found in the respective averages of each division when the data were analyzed on the basis of skill. For all employees in the wood household branch, the differences in favor of trade-union as against non-trade-union plants were 13.1 cents for the country as a whole, 9.6

[10] In the illustrations used in this article, a trade-union plant has been defined as one where a majority of the workers belong to occupations that are covered by either oral or written agreements with trade-union organizations.

cents for the northern district, and 4.5 cents for the southern area. Similar differences appeared when the figures for the northern district were broken down by size of community. In the wood office furniture branch, the variation between trade-union and non-trade-union establishments in the North was 8.6 cents. On the other hand, in metal office furniture in the North, the average hourly earnings were higher in non-trade-union than in trade-union plants, the respective figures being 67.7 cents and 65.3 cents. Lastly, among the northern establishments making public seating, the trade-union plants averaged 4.2 cents higher than the non-trade-union establishments.

Among the small companies in the meat-packing industry located in the northern region, according to the 1937 survey, the trade-union plants averaged 6.1 cents per hour higher for all workers than the non-trade-union establishments, the respective figures being 62.7 and 56.6 cents. A similar difference was found in each size of community, although it was considerably less pronounced in the metropolitan areas of 1,000,000 and over than in other places.

Another illustration is found in connection with the boot and shoe industry. At the time of the survey in 1939, the average hourly earnings of all workers[11] in the country as a whole amounted to 54.0 cents in trade-union plants, which may be compared with 46.4 cents in non-trade-union establishments. This is a difference of 7.6 cents. Similar variations were found in the averages when the data were broken down by sex and skill. Generally speaking, moreover, the trade-union plants also averaged higher than the non-trade-union establishments when the figures were also broken down by size of community and the retail price of shoes, which are the other important factors in the wage structure. (See Table 2.)

VARIATIONS BY SKILL, SEX, AND COLOR

Occupational differentials constitute the core of the wage structure in any establishment. These differentials reflect the variations in occupational skill. In the case of straight-time workers, the wage ladder usually starts with the common labor entrance rate as the lowest rung, leading up to the highest wage paid to the most skilled jobs in the plant. The same is true in connection with employees on piece work or under some production bonus plan, for which the rates are set in a manner to reward for differences in skill among the several occupations.

Generally speaking, the occupational differences found in the individual establishments are similarly reflected in the average hourly

[11] Including workers in slipper plants and in the cut stock units of integrated companies, who were not included in Table 2.

earnings by occupation computed for the industry. In some instances, however, the picture of the industry's occupational wage ladder becomes somewhat distorted. One reason for this is the fact that the occupations in the various plants are not always strictly comparable. Another reason is the introduction of the weighting factor, in terms of the number of workers found in a given occupation in the several establishments covered. On the other hand, the relationships among the averages of the skilled, semiskilled, and unskilled employees as groups are fairly well defined. Among males, the difference between the average hourly earnings of skilled and semiskilled workers is often approximately as much as twice as large as that between semiskilled and unskilled employees. There are usually very few skilled females, but the average of semiskilled females quite often is not much higher than that of unskilled males.

The question has often been raised as to whether or not females doing the same work as males in a given plant receive the same rate of pay. The latter was required by many of the codes under the N.R.A., and it is also insisted upon by the trade unions. Moreover, it is probably in accordance with the principles of good personnel policy, unless the higher rate for males may be justified on the ground that they are required to perform certain tasks in addition to the regular duties of the job, such as lifting heavy loads. On the other hand, it is frequently found in various industries that for the same occupation the average hourly earnings are lower for females than for males, which may be due to the fact that females are employed in the lower-wage establishments.[12]

Some attention has been given in recent years to the differences in hourly earnings between white and Negro employees. Owing to the fact that the latter are for the most part found in the semiskilled and unskilled occupations, they are among the lowest-paid workers in industry. In the northern states, white and colored employees engaged on identical jobs in a given plant are almost invariably paid the same rates. On the other hand, in the southern states, the tendency is for white and Negro workers to be confined to different occupations in the same establishment. In many instances, colored employees on either skilled or semiskilled work are designated as handymen and their wages are considerably below those usually paid to white employees performing similar work. It is also true that some of the lowest-wage industries in that region, such as independent tobacco stemmeries and fertilizer establishments, employ colored workers in large numbers.

[12] In the case of piece or production bonus workers, this may be due to lower productivity among females as compared with males.

CONCLUSIONS

The existing relationships discussed above, as disclosed by the differences in the wage structures of various industries, indicate that those in charge of determining minimum wages under present laws have a great responsibility. Setting a given minimum, for example, may result in laying off the less efficient workers in certain plants. Moreover, it may shift employment from females to males and from Negroes to whites, or vice versa. The minimum may affect only those whose earnings were formerly below it, but it may also be passed on to the higher-paid employees, in order to maintain existing occupational differentials. It may slow down the migration of industry from the northern to the southern states or from the larger to the smaller communities. By affecting greatly the smaller companies, it may also hasten the growth of integration in industry. In other words, the minimum may result in numerous readjustments, which for the time being might cause important dislocations in industry.

On the other hand, it is generally agreed by most persons that the ultimate goal is the highest possible wage level for workers in industry. In this connection, it should be pointed out that high hourly earnings do not necessarily mean high labor costs. For example, two plants may have enormous differences in wage levels, although they manufacture identical products and are located in the same community. Nevertheless the higher-wage establishment is able to remain in business and even undersell the other plant, due to more efficient management and lower labor costs. Hence, higher minimum wages will compel plants to increase efficiency, thereby keeping down labor costs. This process is necessarily slow, and sufficient time should be allowed for establishments to adapt themselves to higher wage levels.

EFFECTS OF THE 25-CENT MINIMUM WAGE ON EMPLOYMENT IN THE SEAMLESS HOSIERY INDUSTRY*

By A. F. Hinrichs
Chief Economist, Bureau of Labor Statistics

It has at times been alleged that the establishment of minimum wages will result in a transfer of business from inefficient to efficient establishments, with the result that inefficient plants will be forced out of business. This, it is claimed, would create a serious problem of unemployment in the neighborhood of the closed plant.

The present report is directed exclusively to this one question: What was the effect on employment in low-wage seamless hosiery mills between October 1938 and September 1939 of the 25-cent minimum wage that became effective on October 24, 1938?

The Bureau of Labor Statistics made a study of hourly earnings in the seamless hosiery industry in August 1938. At that time, when the average hourly earnings of 18,270 workers in a sample of 97 plants were 35.1 cents, it was found that there were 27 plants with 4575 wage earners that paid on the average less than 30 cents an hour, as follows:[1]

Average hourly earnings, cents	Plants	Wage earners
Less than 25	10	1471
25.0 and under 27.5	8	1680
27.5 and under 30.0	9	1424

It was in this group of plants that there was an especially heavy concentration of workers receiving less than 25 cents an hour. 67.0 per cent of all workers getting less than 25 cents were found in these 27 plants, and another 22.5 per cent in the 25 plants paying slightly less (30.0–35.0 cents) than the industry average. It will be seen from the following figures that nearly three-quarters of the workers in the lowest wage plants received less than 25 cents; and that nearly a quarter of the workers were directly involved in plants averaging 30 to 32.5 cents:

Average hourly earnings, cents	Percentage of workers receiving less than 25 cents
Under 25	72.9
25.0–27.5	53.1
27.5–30.0	38.1
30.0–32.5	23.7
32.5–35.0	13.0

* A paper presented at the 101st Annual Meeting of the American Statistical Association, Philadelphia, December 30, 1939.

[1] Bureau of Labor Statistics: *Earnings and Hours in the Full-Fashioned and Seamless Hosiery Industries, 1938* (mimeographed), pp. 79, 81–91.

In contrast with this situation are the plants paying more than average wages. In these plants, in general, less than 6 per cent of the workers were directly subject to a wage increase. In some plants no workers at all received less than 25 cents.

Average hourly earnings, cents	Percentage of workers receiving less than 25 cents
35–40	5.9
40–45	4.9
45 and over	1.0

The present study therefore starts with the knowledge that plants were unequally affected by the 25-cent minimum wage that became effective in October 1938. At one extreme were plants which had to raise the wages of virtually all workers. At the other extreme was a group of plants none of whose workers received less than 25 cents.

The Bureau has received regular monthly reports since the beginning of 1938 covering employment, payrolls and man-hours worked in 76 establishments engaged exclusively in the manufacture of seamless hosiery. Prior to the effective date of the Fair Labor Standards Act, 12 of these paid less than 25 cents on the average; 8 paid 25 cents but less than 27.5 cents; and 12 averaged 29 to 32.5 cents an hour.[2]

None of the low-wage mills that were reporting to the Bureau of Labor Statistics in August 1938[3] went out of business during the first year that the Act was effective. One of them, however, was effectively closed from July to September 1939. It must be assumed, therefore, that there has been one fatality out of 32 low-wage plants.[4] Some fatalities among the seamless hosiery mills, however, are to have been expected in any event.[5] So far as evidence now in hand goes, then, we

[2] In classifying plants, average hourly earnings were computed for each establishment in the months of July, August, and September, 1938. For those plants that were regularly above 32.5 cents, no further analyses of hourly earnings in the individual plants were made.

The plants that averaged less than 32.5 cents were classified in general on the basis of average hourly earnings over the period July to October 1938, inclusive. In a few instances, where average hourly earnings varied widely from month to month, earnings over a longer period were examined to establish that the classification made did not misrepresent the typical behaviour of the plant in question.

No plants in the sample were classified as averaging from 27.5 to 29 cents.

[3] In this connection, it is to be noted that it is necessary to use a sample of mills in operation in 1938 and study their behaviour forward from that time. A larger sample of mills operating in 1939 might have been selected, but, if one is interested in the question of closing mills, such a sample would by definition exclude mills that operated in 1938 and closed thereafter.

[4] One other mill reporting to the Bureau of Labor Statistics, though still running, appears from its record to have been shut down a large part of the year 1939. The operating difficulties of this mill, however, appear to have started early in 1938, before the effective date of the Fair Labor Standards Act. This mill is not included in the sample since complete information regarding it is not available during the full period studied.

[5] For the industry as a whole, 53 out of 485 plants in existence in January 1937 were closed during 1937 and 1938, or at the rate of about 1 out of 20 a year. This does not include plants becoming inactive which have knitting machines still on the floor ready for use. *Confidential Report on the Seamless Hosiery Industry*, March 27, 1939, prepared by Wage and Hour Division for Industry Committee, No. 3, p. 4.

must conclude that the 25-cent minimum wage did not have the immediate consequence of creating stranded communities in the midst of which stands a closed seamless hosiery mill.[6]

To facilitate discussion, the low-wage seamless hosiery mills which constitute the sample have been divided into three groups, as follows: Group I consists of those mills which paid an average wage of less than 25 cents per hour prior to October 24, 1938; Group II consists of those which paid 25 cents or more but less than 27.5 cents; Group III consists of those which paid 29 cents or more but less than 32.5 cents.

Before discussing the effect of the 25-cent minimum wage on employment in low-wage plants, one must distinguish between those mills which complied with the law and those which did not. So far as our information goes, it appears that one of the 12 plants paying less than 25 cents did not change its wage scale until January 1939. This plant is carried in Group I tabulations and is important chiefly as explaining the minor increase in average hourly earnings for this group of mills that occurred between December and January.

In addition, among these 12 mills, however, we have the record of one other mill that averaged consistently less than 25 cents over the period under consideration. Whether because of the advantage which it enjoyed when competitive mills raised wages or for some other reason this plant fared better[7] in 1939 than any group of mills for which we have figures. This plant is not tabulated with the low-wage group for purposes of appraising the effect of the 25-cent minimum wage.

Another Group I mill appears to have displayed what might be termed temporary compliance. It reported wage increases after October 1938 of about the same magnitude as other Group I mills. In the early months of 1939, however, the reported average hourly wage rate dropped again to slightly under 25 cents per hour. This mill is included in the Group I tabulations, but in any case it is so small that its inclusion or exclusion would affect the averages very little.

[6] This is not to be taken to mean that none of these mills would ever have failed as a result partially of the 25-cent rate. The minimum rate of 25 cents was replaced by a minimum rate of 32.5 cents in October 1939. It is obviously impossible to measure the process of attrition that might have taken place had the 25-cent minimum remained in effect over a longer period than 11 months. There is some reason to believe that the process of liquidation works itself out slowly.

The social consequences of declining employment across the years are probably less serious than the consequences of a sudden total cessation of employment opportunity. The passage of time in the first case allows some opportunity for both the migration of workers and perhaps for the development of new industry in the region or even in the community.

[7] As measured by total man-hours worked in the first half of 1939, as compared with man-hours in an average month of 1938.

The plant laid off about 10 per cent of its workers and increased the hours of the remaining force. It appears to have worked at least some of its workers more than 44 hours without paying for overtime. It is to be assumed that this temporary advantage from apparent non-compliance with the law in the first months of its operation will disappear.

With these exceptions, the plants averaging less than 25 cents prior to October 1938 and reporting to the Bureau of Labor Statistics all show considerable wage increases in November.

Among the plants averaging 25 to 27.5 cents, all but one increased average hourly earnings in November. One small plant in this group delayed the increase until December.[8] Among the plants averaging more than 29 cents, the adjustments required by the 25-cent minimum were too small to show clearly in the averages, in spite of the fact that the wages of one-quarter of the workers were affected to some extent. In most mills the variations in average hourly earnings, due apparently to a changing volume of employment, are as great as those that would probably be induced by bringing workers up to 25 cents. The group as a whole did show a slight increase in November, and there is no evidence that any of the reporting plants failed to meet the minimum.

The changes in average hourly earnings for the industry and for various groups of plants are shown in Table I. It will be seen that, though the average for the industry increased, the increase in November was not general but occurred chiefly in the low-wage plants, the wage changes in these plants being large enough to affect the average

TABLE I
AVERAGE HOURLY EARNINGS IN THE SEAMLESS HOSIERY INDUSTRY, JANUARY 1938 TO SEPTEMBER 1939

	Total Sample* (76 Plants)	Group I (11 Plants)	Group II (8 Plants)	Group III (12 Plants)	Remainder of industry (44 Plants)
1938					
January	.372	.242	.279	.320	.418
February	.370	.234	.279	.334	.424
March	.376	.237	.283	.349	.421
April	.373	.232	.269	.344	.424
May	.370	.228	.273	.335	.421
June	.368	.226	.264	.331	.421
July	.349	.219	.263	.302†	.410
August	.360	.221	.267	.311	.414
September	.363	.230	.264	.305	.414
October	.373	.239	.284	.327	.418
November	.381	.288	.330	.331	.417
December	.382	.291	.323	.339	.417
1939					
January	.383	.301	.322	.341	.417
February	.378	.298	.314	.332	.413
March	.383	.295	.323	.336	.418
April	.381	.297	.326	.333	.415
May	.383	.302	.336	.339	.415
June	.383	.302	.321	.338	.415
July	.381	.297	.312	.333	.416
August	.384	.299	.322	.338	.416
September	.390	.310	.333	.342	.423

* Includes 1 plant not included in any of the other groups. The omitted plant would normally have been classified in Group I. It was not so tabulated because its wage scale was not changed to conform to the minimum established by the Fair Labor Standards Act.

† Average hourly earnings in one large mill dropped from 37.3 cents in June to 31.8 cents in July.

[8] It may be noted in passing that this is the only plant in Groups I, II, or III that appeared to be in the process of closing down in September, 1939.

for the industry as a whole. For example, the plants in Group I, which had averaged less than 25 cents, increased average hourly earnings from about 23 cents before October 1938 to about 30 cents thereafter.[9]

The increase of about 7 cents an hour, or 30 per cent, indicates that these low-wage plants made a larger wage adjustment than that required by the law. To have merely raised the workers receiving less than 25 cents to the 25-cent minimum would have involved an increase of about 4.7 cents.[10]

Since nearly three-quarters of the workers in the plants in Group I earned less than 25 cents before the Fair Labor Standards Act became effective, as compared with about half of those in Group II, it is to have been expected that average hourly earnings in the group of plants averaging 25 cents but less than 27.5 cents would rise less than earnings in Group I plants. The increase in fact was from an average of about 27 cents to about 32.5 cents. Here also the increase was greater than the minimum change required by law.[11]

The third group of plants consists of those paying more than 29 cents[12] and less than 32.5 cents an hour. In these plants about one-quarter of the workers had received less than 25 cents an hour in September 1938. Average hourly earnings in these plants rose from about 32.5 cents in the first 10 months of 1938 to about 33.6 cents in the first half of 1939. An examination of individual mill reports shows that this change in the group average is the result of many changes in individual mill averages. The average for this group, unlike that for the two other lower wage groups, did not advance sharply between October and November. However, to have raised those below 25 cents in September to 25 cents in plants averaging 30 to 32.5 cents would have necessitated raising the average for the group about 0.9 cents.[13] Thus, it may be

[9] The increase in the average from December to January reflects the fact that one plant delayed adjusting its rates until January. The unweighted average of the average hourly earnings for the first 10 months of 1938 was 23.1 cents; for the first 6 months of 1939, 29.9 cents.

[10] A survey of wages and hours of labor in the seamless hosiery industry was made in the fall of 1938. (Reported in *Monthly Labor Review*, June 1939, pp. 1388–1403.) A separate tabulation was made of the distribution of workers by hourly earnings in plants reporting average hourly earnings under 25 cents. The increase of 4.7 cents referred to above was computed from the absolute aggregates of the tabulation.

[11] From computations based on the absolute aggregates for mills reporting average hourly earnings of 25 to 27.5 cents in the 1938 survey, it is estimated that simple payment of 25 cents per hour to all workers previously receiving less than that figure would have resulted in an increase of 2.1 cents per hour in the aggregate average wage of the Group II plants.

[12] This group of plants may legitimately be compared with the group of plants in the earlier study reported to average 30 to 32.5 cents. The rather unusual limit of 29 cents was adopted, because there are 3 plants with average hourly earnings a fraction under 30 cents in the months immediately preceding October. In earlier months these plants frequently had earnings above 30 cents. On the score of earnings they are much closer to the group of plants averaging 30 to 32.5 cents, many of which had earnings of only slightly more than 30 cents, than to the group averaging 25 to 27.5 cents.

[13] Computed from absolute aggregates of the 1938 survey of wages and hours of labor as in the case of the Group I and Group II plants.

There are a number of months in which as large a change as this in the group average occurred merely as a result of variations in the amount of employment. In general it appears that a decrease

said that a large part of the increase in average hourly earnings in these plants since 1938 is due to adjustments to the minimum wage.[14]

The most significant change brought about by the law was the change in the wage relationship of these various groups of plants. The Group I plants had had wages averaging 4 cents an hour under Group II prior to the effective date of the Act; in 1939, they averaged 2.5 cents under Group II. The Group II plants had averaged 5.5 cents under Group III; in 1939 they averaged as a whole only 1 cent less. Finally, the difference between the Group III plants and the higher wage portion of the industry decreased somewhat. The wage differential between plants throughout the industry was sharply narrowed. The high wage plants were relieved of a large part of the wage competition from the lowest wage part of the industry. On the other hand, Group I plants faced a 30 per cent increase in hourly earnings.

There are no data as to the volume of business of all of these mills before and after the Act. The most comprehensive approximation of volume of production is that afforded by reports of man-hours worked. It must be emphasized, even before these figures are presented, that changes in the volume of employment are not necessarily proportioned to changes in the volume of production. As will be indicated, there have been cases in which the volume of employment has been reduced because of the installation of improved machinery though the volume of production was unchanged or even increased.

Marked changes in the volume of employment have occurred since the Fair Labor Standards Act became effective. In the 76 mills as a whole, the average number of man-hours worked per month increased by 15.7 per cent in the first nine months of 1939 as compared with the year 1938. Those mills (Group I) that had averaged less than 25 cents an hour, however, actually worked about 12 per cent less man-hours per month in 1939 than in 1938. Mills that had averaged 25 to 27.5 cents (Group II) experienced an increased volume of employment, but the increase was less than the increase in the average for the Group III mills, which in turn was less than the increase for the industry as a whole.[15]

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of about 10 per cent in the number of man-hours worked is accompanied by an increase of slightly less than 1 cent in average hourly earnings.

[14] Selective lay-off might have had these results, but a field case study and an examination of labor turn-over reports to the Bureau of Labor Statistics does not indicate that this occurred to any appreciable extent.

[15] This differentiated increase in the volume of employment does not appear to be merely a normal cyclical phenomenon. This point must be noted, because the entire argument of the text is open to the theoretical objection that 1938 was a year of depression and that a larger recovery is to be expected in high-wage than in low-wage mills. This line of reasoning presupposes that the low-wage mills, partly because of low wages, were able to hold onto a larger share of the total seamless hosiery business than the higher wage mills. In fact, they were not. The statistical record for these groups of mills only extends back to 1937, but the first 4 months of 1937 were months of exceptionally heavy production and

TABLE II
EMPLOYMENT, PAYROLLS, AND MAN-HOURS WORKED IN SEAMLESS HOSIERY MILLS, AVERAGE FOR FIRST 9 MONTHS OF 1939
(Average 1938 = 100)

	Number Employed	Payrolls	Volume of Employment (man-hours worked)
Total industry	110.1	119.8	115.7
Group I	92.6	109.9	88.0
Group II	100.1	120.2	104.9
Group III	106.6	110.5	107.4
Balance of industry	114.3	122.3	122.8

In the case of Group I mills, all but two companies[16] show a decrease both in man-hours worked and in employment between 1938 and 1939. The decrease in employment occurred primarily in the closing months of 1938. In the case of some mills at least, there appears to have been a selective layoff of employees with an increase of working time for those retained, because the number of employees was sharply reduced at first while the total number of man-hours worked changed comparatively little in the first few months after the minimum wage became effective. On the whole, however, the decrease in employment between 1938 and 1939 was accompanied by an even more marked decrease in man-hours worked.

It is obvious that the differentiated wage increase implicit in meeting the 25-cent minimum would have disturbed the competitive equilibrium between low-wage and higher wage mills. There is no reason, however, to believe that the Congress intended to freeze competitive relationships in such fashion that each group would continue to receive the exact proportion of the total seamless hosiery business of the country that it happened to be receiving in 1938.

In the case of at least one mill in Group I, it appears that the decrease in employment and in the number of man-hours worked is precisely what the Congress sought to achieve. This mill was owned by a company with more than one plant. Regarding this company's operations as a whole, its wages averaged substantially more than 35 cents.

shipments. The average for these four months may be taken to represent boom conditions. It is interesting to note that Group I mills, which showed a decrease in employment from 1938 to 1939, worked on the average a total of 40 per cent more man-hours per month in the first 4 months of 1937 than in 1938 and employed 16 per cent more workers. Group II mills had worked 33 per cent more man-hours and employed 12 per cent more workers in 1937 than in 1938. Group III mills had worked 23 per cent more man-hours and employed 2 per cent more workers. In other words, it appears that those mills which lost most heavily from 1937 to 1938 continued to lose or gained less than the industry as a whole from 1938 to 1939.

[16] One mill falls so close to the borderline separating Group I and Group II plants that it would be almost equally appropriate to classify it in Group II. It seems wiser to leave the plant in question in Group I than to make classification in any way dependent upon the subsequent behaviour of the plant. There are perhaps 2 other mills in Group I that similarly have average hourly earnings from July to September 1938 that are just below 25 cents, but which would be classified above 25 cents if a longer eriod were taken as the base.

The other company in Group I which showed an increase in man-hours worked in 1939 was that which apparently ceased to comply with the Act several months after it went into effect.

The low-wage mill had been recently established and had enjoyed a steady growth. In 1937 a wage advance was granted by the company in a high-wage unit, but no change in wage rates was made in its low-wage property. In 1938 the total volume of business[17] done by the company declined. During this period wages were not reduced from the 1937 level, but a larger share of the business went to the low-wage mill which therefore continued to grow, even during the depression of the company's business. In October 1938 the minimum wage of 25 cents appears to have affected average hourly earnings only in this company's low-wage mill. Fewer man-hours were worked per month in this mill in 1939 than in 1938, but the proportion of the total number of man-hours worked by the company was as large in 1939 as in 1937.

In this case an apparent shift of business in 1939 from a low-wage to a higher-wage mill took place within the confines of a single company. The company as a whole showed no loss of status in the industry. The minimum wage law in this case appears chiefly to have restored a wage relationship that existed prior to 1937 between the various mills operated by this company.

Another multiple unit company had one plant classified in Group I; a second mill owned by this company paid wages less than the average for the industry but substantially above those in the property classified as a Group I mill. In 1936 and the first quarter of 1937 the lower wage plant had almost 30 per cent of the man-hours worked in the company. Prior to October 1938 this ratio was reduced to 25 per cent. When wages were raised in October 1938 in the lower wage property but not in the higher, the difference in hourly earnings between the two mills was all but extinguished and the concentration of business continued. In the first half of 1939 the mill under consideration had 21 per cent of the total number of man-hours of employment offered by the company. The trend of employment in this case was then already away from the low-wage unit before the effective date of the Fair Labor Standards Act.

The plants that averaged 25 to 27.5 cents an hour (Group II), unlike those that averaged less than 25 cents (Group I), gained somewhat in volume of employment from 1938 to 1939. However, while the Group II plants worked an aggregate of 4.9 per cent more man-hours per month in the first 9 months of 1939 as compared to the year 1938, the industry as a whole averaged 15.7 per cent more.

While this describes the average change in the position of these plants, it is an average and not a universal experience. Through the first 7 months of 1939 one large plant employed substantially fewer people than in the corresponding period of 1938 or of 1937. However,

[17] As measured by man-hours worked.

the loss of employment in this mill began in the third quarter of 1938 and not after the Fair Labor Standards Act became effective. A second plant, as has been mentioned, was virtually closed down in the third quarter of 1939. On the other hand, at least one of the plants experienced an increase of employment and man-hours greater than the industry as a whole. In other words, among plants averaging 25 to 27.5 cents, all of which had to increase average hourly earnings by substantial amounts, the repercussions of this change were more selective than in the case of Group I plants.

Eight of the plants in Group III made no apparent change in wage rates during 1938. Their individual adjustments to the 25-cent minimum after October 1938 resulted in minor differences in average hourly earnings in subsequent months. This group of 8 plants as a whole averaged 9.8 per cent more man-hours per month in the first 9 months of 1939 than in the year 1938. Three plants, however, had almost the same volume of employment in 1939 as in 1938, despite the fact that the industry averaged 15.7 per cent more. Two of these were two of the four plants that had had the largest decline in employment from 1937 to 1938, and continued to lose relative to the group as a whole from 1938 to 1939. One of these two plants increased hourly earnings by about 1.5 cents; the other, hardly at all. In this connection it may be noted that neither of the other two plants which suffered a serious decline from 1937 to 1938 changed hourly earnings from 1938 to 1939. One of them actually recovered to the 1937 volume of employment in 1939 and the other expanded somewhat more than the average of the group under consideration.

The remaining four mills in Group III all made substantial cuts in wage rates at various times during 1938 prior to October. In July one of them partially restored a wage cut made in February 1938. All showed wage increases after October 1938. Collectively, the group averaged 6.7 per cent more man-hours per month in 1939 than in 1938. Comparing the average for the year 1938 with the first nine months of 1939, average wages per hour in these plants together increased about one-half cent.

It is important to note that the shifts which have been described for the seamless hosiery industry are not essentially regional shifts. It is true that the 1938 survey of wages in the seamless hosiery industry showed no plants with average hourly earnings of less than 30 cents an hour in the North. Out of a total sample of 97 plants, there were 27 plants in the South that paid less than 30 cents an hour. On the other hand, there were 18 plants in the South and 7 in the North that had averages from 30 to 35 cents an hour. Finally and perhaps most important, there were 25 plants in the North and 20 plants in the South that

averaged 35 cents an hour or more. It was these plants, almost equally distributed as between the North and the South, which appear to have gained some advantage from the establishment of a minimum wage of 25 cents an hour.

This statistical investigation of existing records of man-hours worked and average hourly earnings paid was supplemented by a case study in the field. The mills which had been paying average hourly earnings in 1938 which were as much as or greater than the average for the industry as a whole were unanimous in their report that the 25-cent minimum wage had had almost no repercussions on their wage structure.

Few readjustments to meet the 25-cent minimum were reported by mills paying below the industry average but more than 29 to 30 cents per hour. In all such mills visited, piece rates were left unchanged. With a definite minimum to meet, most workers earned the statutory minimum wage. A small make-up in pay was given the occasional worker who averaged less than 25 cents per hour over a pay period. A few workers who consistently averaged below the minimum were released.

Among that small group of mills with average hourly earnings prior to the Act of less than 29 cents, and, more particularly, those with earnings of less than 25 cents, three types of readjustments were noted.

In all of the Group I and most of the Group II mills, rates of pay in most occupations were substantially increased. This was usually supplemented by a make-up in pay to workers who despite the increase could not earn the statutory minimum. Some low productivity workers were discharged. However, the proportion of workers so dismissed to all workers appeared to be small in every plant visited.

The decline in total man-hours worked in the Group I mills has been mentioned. In some instances, this decline reflected in fact a decrease in the volume of business done. This was true in that group of plants which made no essential changes in their equipment. It is impossible from the field study to indicate the proportion of the total number of mills in which this was true.

In a relatively large number of cases it was found that the mills which had been paying relatively low wages had also been using hand transfer machines. The hand transfer machine is obsolete, certainly with reference to the production of the cheaper grades of seamless hose. Low wages and a machine investment which has depreciated toward the vanishing point have, however, permitted such machines to operate in the past in competition with newer automatic equipment. There seems to have been in fact a partial competitive equilibrium that was disturbed by the necessity of raising wages in the lowest wage mills.[18]

[18] Hand transfer and automatic knitting machines operate at approximately the same rate—about 200 r.p.m. At this speed it takes a machine about ten minutes to produce one pair of men's half hose, or two hours for a dozen pairs.

It was found, as was to be expected, that a number of mills had, therefore, traded in hand transfer for automatic machines. In these cases, there was some decrease in employment and in the number of man-hours worked, but the decrease in man-hours did not reflect a decrease in the volume of business done.

Finally, there appears to have been some change in the character of the product manufactured in establishments which had formerly paid low wages. It is possible at comparatively small cost to adapt hand transfer machines to the automatic production of anklets which do not require the joining of separately knitted tops and bottoms. Some of the mills equipped with hand transfer machines added the attachment necessary to go over to the production of anklets and maintained their volume of production in the face of declining total man-hours.

By and large, it appears that about 10 per cent of the establishments in the industry, those which had averaged less than 25 cents an hour prior to the Act, were faced with serious operating difficulties. To a lesser extent, this was true for about one-quarter of the plants in the industry which had averaged less than 30 cents per hour. In some instances, the competitive pressure resulted in an absolute loss of business to these establishments, though there is no evidence that any of them were forced to a sudden cessation of operations because of the 25-cent minimum wage. On the other hand, there were instances where an adaptation of the machinery permitted so great an increase in the productivity of labor that labor costs were lower after the 25-cent minimum wage became effective than they had been before. On the whole, we must conclude that the 25-cent minimum wage during the period in which it was in effect resulted in no general hardship of the sort which is visualized when we talk of the problem of forcing inefficient plants out of existence.

Depreciation and obsolescence have reduced the market value of a hand transfer knitting machine to a very low figure. A manufacturer replacing such machines with new automatic equipment must then make an additional investment amounting to from $1,000 to $1,500 per machine, depending on the type installed. Additional depreciation and interest charges on the new equipment may then be expected to amount to from $150 to $200 per year per machine.

Assuming that the manufacturer is able to run the new equipment two shifts of 8 hours each, five days a week and 50 weeks a year, the additional expense will amount to 4 or 5 cents per hour of machine operation. Since it takes about 2 hours to knit a dozen pairs of men's half hose, this will amount to 8 or 10 cents per dozen pairs.

Piece rates for hand transfer knitting before the application of the Fair Labor Standards Act have been reported from 12.5 to 16 cents per dozen pairs. Corresponding piece rates on automatic machines ranged from 2.5 to 3.5 cents. A minimum differential in the neighborhood of 9 cents per dozen pairs is indicated. This is approximately equal to the additional expense of installing and using the automatic machines. The equilibrium is clearer when it is considered that hand transfer machines remained in place in 1938 for the most part only in the low wage plants, while the high wage plants had in general already installed automatic equipment.

The approximate balance in costs was obviously disturbed by the application of the 25-cent minimum wage. Even an identical percentage increase in piece rates for both hand transfer and automatic knitting would give a cost advantage to the latter. As a matter of fact, mills which found it necessary to increase piece rates to comply with the law were more frequently using the hand transfer process.

THE PROBLEM OF OUR EXCESSIVE BANKING RESERVES*

By Lawrence H. Seltzer
Wayne University

PRODIGIOUS VOLUME OF ACTUAL AND POTENTIAL EXCESS RESERVES

The problem of what to do about the unprecedented and still-growing volume of excess reserves that has come into the possession of American banks during the past six years is in some respects the major monetary problem confronting the United States.

Prior to 1931, the aggregate excess reserves of member banks were often a minus quantity and apparently were rarely if ever as much as $100 millions.[1] Then, in response to open market purchases of Government securities by the Reserve banks,[2] they rose to $859 millions by the end of 1933. But in the last six years a truly colossal further increase has taken place in both total and excess reserves: Total reserves have risen from $2.7 billions to $12.2 billions; and excess reserves, from the $859 millions cited above to $5.6 billions. The principal sources of these changes are set forth in Table I.

Great as have been the increases of the past six years, further gains in member bank reserves appear to be more likely than significant reductions in the near-term future.

Although our net capital imports since the end of 1934 have approximated $5 billions, of which $3 billions represents short-term banking funds,[3] the present international situation favors neither the repatriation of foreign funds nor the investment abroad of American funds. Our favorable balance of international payments on trade and service accounts is likely to be accentuated if the present war continues; for European countries would be anxious to increase their takings of American goods without being able to make commensurate increases in their exports. Under present conditions, it is reasonable to expect that the bulk of the annual additions to the world's monetary gold stocks, approximating $1,300 millions, will flow to the United States on either trade or capital account.

Domestically, a modest restrictive influence upon the growth of

* A paper presented at the 101st Annual Meeting of the American Statistical Association, Philadelphia, December 28, 1939.

[1] Cf. *Annual Report* of the Board of Governors of the Federal Reserve System for 1937, Table 5, which contains estimates for selected call dates.

[2] In amounts more than sufficient to counteract the effects of currency withdrawals and repayments of member bank borrowings.

[3] *Treasury Bulletin*, November 1939, p. 34.

total and excess reserves may be exerted by a continuance of the almost uninterrupted growth in the amount of money in circulation that has taken place during the past nine years. On the other hand, the very fact that the circulation today is about $3 billions greater than in 1929 indicates that a rather sizeable potential source of additional reserves may some day be realized if a reversal should take place in the recent trend of circulation.

TABLE I

SOURCES OF CHANGE IN MEMBER BANK RESERVES
December 30, 1933–January 31, 1940
(Millions of dollars)

	Dec. 30, 1933	Jan. 31, 1940	Net Change
Sources of Increase			
Monetary gold stock	4,036	17,931	13,895
Treasury currency outstanding	2,303	2,971	668
Total increases			14,563
Sources of Decrease			
Money in circulation	5,519	7,376	1,857
Treasury cash holdings (includes Stabilization Fund $2,000)	284	2,358	2,074
Non-member deposits with Reserve Banks and other F. R. accounts	492	971	479
Treasury deposits with Reserve Banks	3	549	546
Reserve Bank credit outstanding	2,688	2,503	185
Total decreases			5,141
Total member bank reserve balances	2,729	12,151	9,422
Required reserves	1,870	6,591	4,721
Excess reserves	859	5,560	4,701

Source: *Federal Reserve Bulletins* and weekly press releases.

Finally, the President and the Secretary of the Treasury are authorized under existing law to exercise monetary powers by which a total of more than $12 billions could conceivably be added to the country's bank reserves. These powers and the amounts that might be realized by exercising them are indicated in Table II.

RESULTING STRUCTURAL CHANGE IN FEDERAL RESERVE SYSTEM

The sheer bulk of the existing excess reserves and their origin outside of the Reserve Banks have created what amounts to a real structural change in our banking system. Formerly the member banks were de-

pendent upon Reserve Bank credit for a large fraction (sometimes more than all) of even their required reserves, thereby making them continuously sensitive to changes in central banking policy. The powers of the Reserve Board were tolerably well adapted for those conditions, under which a change of a few hundred million dollars of Reserve Bank credit could be expected to produce results of considerable magnitude. They were not designed to cope with the revolutionary increases in the country's bank reserves that have taken place in the last few years.

TABLE II

MEANS WHEREBY THE PRESIDENT AND THE SECRETARY OF THE TREASURY MAY INCREASE VOLUME OF BANK RESERVES

(Billions of dollars)

1. Use the stabilization fund to purchase government securities	2.0
2. Monetize the silver bullion now held at cost value in the general fund—that is, revalue it at $1.29 an ounce and issue silver coins or certificates therefor	1.5
3. Raise the monetary value of silver from $1.29 an ounce to $2.19 an ounce—the same percentage increase as was made in the case of gold.*	2.3
4. Reduce the weight of the gold dollar to 50 per cent of its pre-1934 weight—that is, raise the price of gold from $35 an ounce to $41.34 an ounce.*	3.1
5. Increase the monetary value of silver to $2.59 an ounce (to a ratio of 16 to 1 with the weight of the gold dollar as reduced in 4)*	1.0
Subtotal	9.8
6. Issue "Thomas currency"†	3.0
Total	12.8

* And spend the "profit" for debt retirement or otherwise. Numbers 3 and 5 assume that 2 has been done.

† "Thomas currency" can be issued if the President finds that this is necessary in addition to "Thomas open-market operations" conducted by the Federal Reserve Banks, or if the Secretary of the Treasury is unable to secure the consent of the Federal Reserve Banks and the Federal Reserve Board to such open-market operations; and "Thomas currency" can be issued "only for the purpose of meeting maturing Federal obligations to repay sums borrowed by the United States and for purchasing United States bonds and other interest-bearing obligations of the United States. . . "

Already the Reserve Board has used up most of the power granted it under the 1935 Act to raise member bank reserve requirements. Changes in the rediscount rates will be chiefly of ceremonial importance so long as the member banks do not have to borrow. And Reserve Bank power to absorb member bank reserves by open-market sales of securities is now subject to very distinct limitations:

(1) As respects mechanical absorptive power, the Reserve Banks'

portfolio of "Governments" is big enough to absorb less than one-half of the present volume of excess reserves even if it were completely liquidated.

(2) The effects of large-scale liquidation of "Governments" by the Reserve Banks could not be confined to the absorption of member bank reserves. The long-term capital markets would be directly and adversely affected. Further, a severe decline in bond prices would inflict serious losses on banks generally. Securities now constitute 60 per cent of the member banks' earning assets, and United States Government obligations, direct and guaranteed, constitute 71 per cent of their holdings of securities.[4] More than three-fifths of the aggregate amount of "Governments" held by member banks, moreover, consists of maturities longer than five years.[5] These considerations might well deter the Reserve authorities from a vigorous use of the power to liquidate their holdings of "Governments."

(3) The portfolio of "Governments" held by the Reserve Banks now constitutes their chief source of income and its elimination would make them dependent upon either Congressional appropriations or assessments upon the member banks, neither of which alternatives is likely to be welcomed by the Reserve authorities.

(4) Finally, even if the period of deficit financing by the Federal Government comes to an end shortly, the Treasury will face very large maturities and the consequent need for extensive refunding operations every year for some years to come. It will be difficult for any Open Market Committee to avoid giving heavy weight to this consideration.

POSSIBLE SOLUTIONS

It seems clear that the developments of the past several years have fundamentally undermined the powers of our central banking authority and that a substantial change in the statutory frame work of our banking system will probably be required to restore effective monetary control. Several possible lines of attack toward this end may now be briefly considered.

1. *Raising the Existing Reserve Requirements.* The simplest method of adapting reserve requirements to the present plethora of reserves would appear to be merely to raise the required reserve proportions sufficiently to absorb all or nearly all of the existing excess reserves. An increase of 50 per cent in the existing requirements would remove about $3.3 billions of excess reserves, leaving the level at about $2.3 billions (or within the amount of the open-market portfolio of the Federal

[4] *Member Bank Call Report* of June 30, 1939.
[5] *Ibid.*

Reserve Banks); and an increase of 75 per cent in present requirements would remove all but about $600 millions of the existing excess reserves.

Such action would not only reduce the volume of excess reserves but it would also reduce the credit-supporting power of every dollar of bank reserves. Thus a 50 per cent increase would reduce the credit supporting power of each dollar of bank reserves from about $6\frac{1}{2}$ to 1 to about $4\frac{1}{3}$ to 1, assuming an unchanged relative distribution of deposits.

It must be observed, however, that greatly increased reserve requirements would probably accentuate instability in the high-grade bond market under present conditions. "Governments" have to a considerable extent replaced call and similar loans as the variable holding through which banks may make ready adjustments in their reserve positions. This factor has not been of more than passing importance during the past few years because a thick layer of excess reserves has served as a buffer for the Government securities portfolios. Many banks acquired substantial holdings of long-term "Governments," despite the price risk involved, on the ground that their large excess reserves assured them the ability to hold the securities to maturity; and, indeed, only a small proportion of the aggregate amount of "Governments" held by banks consists of truly short-term securities.[6] If the buffer of excess reserves should now be largely removed, the adjustments in the actual or desired reserve positions of individual banks would fall more directly upon their portfolios of "Governments," and the sensitiveness of bankers generally to price movements in the bond market would be increased.

In addition, while an increase of 50 per cent or even 75 per cent in the existing reserve requirements would only transfer to the required category funds that the banks are themselves now holding idle voluntarily, such an increase would nevertheless exert an immediately restrictive influence. In order to regain a sizeable margin of protection against the possibility of being forced to sell "Governments" in an unfavorable market, banks would probably tend to reduce the total of their loans and investments.[7]

[6] Cf. "*Assets and Liabilities of Operating Insured Banks*," Report No. 11, of the Federal Deposit Insurance Corporation, table on page 35. About five-eighths of the $15 billions of Government securities, direct and guaranteed, held by the insured commercial banks on June 30, 1939, consisted of maturities longer than five years; and about one-third consisted of maturities longer than ten years.

[7] During the calendar year 1937, member banks reduced their holdings of Government securities (direct and guaranteed) by $1,174 millions, of which $856 millions was liquidated in the first six months; and the average yield of all Treasury bonds not due or callable for 12 or more years rose from 2.46 per cent at the beginning of the year to 2.83 per cent early in April, and ended the year at 2.68 per cent. Several factors, including notably an increase in the volume of loans, contributed to this result; but the 33⅓ per cent increase in reserve requirements that went into effect, half on March 1 and half on May 1 of that year, superimposed upon a previous 50 per cent increase in the preceding year, was certainly among these.

It is also to be noted that membership in the Reserve System is still voluntary, and onerous reserve requirements involve the danger of important withdrawals from the System. Yet reserve requirements that are high enough to be burdensome to individual banks may nevertheless be too low to prevent an injurious credit expansion.

2. *The 100 Per Cent Plan.* Although the volume of money, including bank deposits, could conceivably become redundant even if it were secured dollar for dollar by gold, the whole problem of excess reserves arises as a practical matter out of the fact that a fractional reserve banking system permits the banks to create deposits equal to several times each addition to their reserves. It follows, therefore, that the problem would virtually disappear if all banks had to keep 100 per cent reserves against demand deposits. Additions to bank reserves, as through gold imports, could then bring about only equal changes in the volume of demand deposits, instead of the much greater changes that are possible under the present fractional reserve system.

The merits of the 100 per cent reserve plan have been adequately presented elsewhere.[8] Sharp increases and decreases in the country's supply of money would no longer occur as the by-products of expansion and contraction of bank loans and investments; although substantial fluctuations might persist in the velocity of circulation. The supply of money would be directly regulated by governmental authority. This would facilitate the execution of deliberately-conceived monetary policies.

The "pure" versions of the 100 per cent reserve plan would require radical changes in the country's banking system. Commercial banking as we know it would be abolished: even short-term commercial loans could be made only with funds representing time or savings deposits or banking capital. But the concessions to present practice and to the difficulties of transition that have been made in programs proposed by Professor Irving Fisher and associates[9] and Professor J. W. Angell,[10] among others, would seem to minimize the weight of objections of this nature and yet to retain the essential advantages of the plan.

The 100 per cent reserve plan, however, is aimed at a broader problem than that of excess reserves; and it is unlikely to be adopted or rejected solely in connection with the latter problem.

3. *Imposing Very High Reserve Requirements on Future Increases in Deposits.* A simple but powerful method of control that could be

[8] Cf. Irving Fisher, *100% Money*, New York: 1936; J. W. Angell, "The 100 Per Cent Reserve Plan," in *Quarterly Journal of Economics*, November, 1935; Laughlin Currie, *The Supply and Control of Money in the United States*, Cambridge: 1934; H. C. Simons, *A Positive Program for Laissez-Faire*, Chicago: 1934; and Frank D. Graham, "Reserve Money and the 100 Per Cent Proposal," *American Economic Review*, September, 1936.

[9] In a manuscript mimeographed for private circulation.

[10] *Loc. cit.*

quickly introduced without serious disruption of existing banking practices would take the form of a decree, either by Congress directly or by the Board of Governors of the Federal Reserve System after it had received appropriate powers, that after a stated date all *increases* in the demand deposits of any bank be secured by a stated very high proportion of reserves—something between 50 and 100 per cent. If the latter figure were chosen, all possibility of further credit expansion from the then existing volume of excess reserves would be limited to the absolute amount thereof; and the power of additional gold imports and silver certificates to create demand deposits beyond their own face value would be eliminated.

Since the high reserve requirements, when effective, would apply only to future increases in deposits, they would not force an immediate contraction in the existing volume of loans and investments, and they would not reduce the total reserves or the nominal excess reserves of any bank. To the extent that some banks subsequently gained deposits at the expense of other banks, however, the amount of required reserves as a whole would be increased. To compensate for the effects of such movements, as well as to support the profit motive in bank competition for deposits, it might be desirable to set the reserve requirement for additional deposits at a figure well below 100 per cent.

Special provisions, possibly allowing a wide measure of administrative discretion to the banking authorities, would be necessary for a just application of the proposal to newly organized banks. Further, unless the proposed reserve requirement were made applicable to all insured commercial banks, rather than only to member banks, a significant fraction of the country's banking resources would remain uncovered, and a strong inducement would be provided for many member banks to withdraw from the System. Likewise, there would have to be some protection against evasion by the nominal transforming of demand deposits into time deposits.

This method of limiting credit expansion has the merits of simplicity, ease of application, and powerful results. It would not solve, and it might intensify the problem of bank holdings of Government securities; for once the measure were in effect, the principal source of funds for customer loan expansion might be the proceeds of the liquidation of Government securities. It would, of course, vastly reduce or eliminate the need for Reserve Bank sales of Government securities for the purpose of absorbing excess reserves.

4. *Imposing Restrictive Capital Deposit Ratios.* The power of excess reserves to support an excessive credit expansion could be checked for a considerable period at least by the imposition of minimum capital-

deposit ratio requirements for expansion, even though reserve requirements remained unchanged. Under this method excess reserves would be rendered sterile beyond the margin allowed by law until the additional capital sums were raised. The restriction could take some such form as the following:

> No operating insured commercial bank shall increase its total deposit liabilities by more than 10 per cent of the amount of such liabilities on (a stated date) unless its total capital funds shall exceed 11 per cent of its total deposit liabilities after any such increase; nor increase its total deposit liabilities by more than 20 per cent unless its total capital funds shall exceed 15 per cent of its total deposit liabilities after any such increase; nor increase its total deposit liabilities by more than 30 per cent unless its total capital funds shall exceed 20 per cent of its total deposit liabilities after such increase.

If such restrictions had been applicable to the 100 largest banks in the country at the end of 1938, these banks could not have expanded their deposits by more than 20 per cent unless their capital funds had been increased by more than $2 billion or by about 66⅔ per cent.[11]

To prevent excessive curtailment of services to their communities by banks which were unable or unwilling to raise sufficient additional capital funds, it should be provided that banks which did not meet the new capital-deposit ratio requirements could accept additional deposits if the latter were secured by reserves of 100 per cent.

It would be obviously desirable that any such capital-deposit ratio requirement be applied to banks generally, or at least to all insured commercial banks, rather than only to member banks of the Federal Reserve System.

The restrictive effect of capital-deposit ratio requirements could conceivably be seriously impaired if a rise in interest rates during a period of booming business so increased bank earnings as to enable banks generally to raise large amounts of new capital. Nevertheless, capital-deposit ratio requirement could exert an important retarding influence upon credit expansion because of the considerable time that would probably be required for raising large amounts of new banking capital; and it would have the collateral effect of providing greater safety margins for depositors.

Indeed, this method would have more merit for the latter purpose than for solving the problem of excess reserves. The ability of banks to raise additional capital funds would not provide a reliable measure of the country's need for additional bank deposits. On the other hand, in view of the increased proportion of bank assets now con-

[11] Computed from aggregate balance sheet figures published in the *American Banker* of January 24, 1939.

stituted by investments, additional banking capital would be desirable to widen the margin of safety for depositors; and the method discussed above has virtues for this purpose.

5. *Requiring Additional Reserves in the Form of a Special Series of Treasury Obligations.* Under the National Bank Act, Congress established an effective upper limit to the aggregate volume of National Bank Notes that might be outstanding by requiring that every bank issuing such notes secure them dollar for dollar by the deposit of United States bonds of certain specified issues—bonds bearing the circulation privilege, so-called. By granting this privilege to only a few issues, Congress was able to limit the maximum possible note circulation regardless of how ready the banks might be to meet the capital and cash reserve requirements also stipulated.

The present proposal contemplates a modified application of the same principle. For concreteness, let us assume the following proposal: that Congress enact a measure requiring all banks insured by the Federal Deposit Insurance Corporation to maintain, in addition to any other reserves required by Federal or State authorities, a reserve equal to 25 per cent of their demand deposits in the form of a special series of Treasury bonds which alone would bear the Reserve privilege. These bonds would bear interest, let us say, at 1½ per cent; they would be callable for exchange into like bonds bearing a higher or a lower rate of interest, or for final redemption, at any time upon four months' prior notice, by act of Congress; they would be payable upon demand of any insured bank at any Federal Reserve Bank; and any Federal Reserve Bank could present them for payment at the Treasury upon four months' prior notice. The bonds need bear no final maturity date. They could be made non-transferable except by and to the Reserve Banks. If desired, the Bond Reserve could be required against time as well as demand deposits.

Initially, the Reserve privilege bonds would be offered only in exchange for outstanding Government obligations held and tendered by insured banks and the Reserve Banks. The price basis of outstanding obligations for the purpose of the exchange would be determined by the Secretary of the Treasury. The amount of the initial offering would be determined by agreement between the Secretary of the Treasury and the Board of Governors of the Federal Reserve System, with the minimum amount fixed by Congress. This minimum might well be perhaps one billion dollars in excess of that required to enable the insured banks to meet the new reserve requirement and to provide a supply of the bonds for the Reserve Banks. The ordinary Government

obligations acquired by the Treasury through the initial exchange offering could be cancelled or subsequently reissued from time to time as new funds were needed, at the discretion of the Secretary of the Treasury.

After the initial exchange offering, further issues of the Reserve privilege bonds would be sold only to the Reserve Banks and in such amounts as the Board of Governors might from time to time request, within any limitations imposed by Congress. When desirable for the accommodation of expanding credit needs or for other reasons, the Reserve Banks would make their holdings of Reserve privilege bonds available to insured banks in such amounts and at such times and on such terms, either by sale or loan (re-purchase agreement), as the Board of Governors might from time to time determine. Banks would be permitted to accept demand deposits not adequately covered by their Bond Reserves if cash reserves of 100 per cent were maintained with the Federal Reserve Banks against such deposits.

The proposed bond reserve requirement would probably necessitate no net increase in the aggregate bank holdings of Government securities. On June 30, 1939, the insured commercial banks as a whole held direct Government obligations amounting to $11.9 billions, or approximately 32 per cent of their aggregate demand deposits and about 23 per cent of their total deposits, including interbank deposits.

It will be clear upon brief reflection that the adoption of this proposal would result in the disappearance of the present problem of excess reserves and would yield collateral results of great importance:

(1) The redundant volume of reserve deposits with the Federal Reserve Banks would no longer govern the possible volume of credit expansion. The effective reserve requirement would become the special series of Treasury bonds, the available volume of which would be controlled by the Board of Governors of the Federal Reserve System. By varying the terms and other conditions on which the Reserve bonds were made available to the banks, the Board could exercise its control flexibly. The condition of our effective bank reserves would no longer be dominated, as it has been for the past half dozen years, by international gold movements. If gold continued to flow to the United States in large amounts, no costly sterilization program by the Treasury, involving an increase in the interest-bearing public debt, such as was undertaken in 1937–38 ,would be necessary.

(2) Since the Reserve bonds could be redeemed at par at any time by any insured bank, no bank could ever suffer a principal loss on its holdings of Reserve bonds. The substitution of such bonds for the

bulk of the present "Governments" held by banks would therefore eliminate a serious source of instability and danger now residing in the banking structure—the ever-present possibility of widespread "dumping" of "Governments" by banks. Further, this guarantee against price depreciation in earning assets equal to 25 per cent of their deposit liabilities would be tantamount to an increase in the capital of all insured commercial banks. That is, the effectiveness of their present capital as a margin of safety against shrinkage in the value of their assets would be increased because the amount of depreciable assets would be reduced. It need hardly be said that the Federal Deposit Insurance Corporation could contemplate with satisfaction a situation in which nearly one-half of the assets of every insured commercial bank consisted of cash and securities guaranteed by the Government against price decline.

(3) Although the Reserve bonds would be payable on demand so far as any single bank is concerned, they could be regarded by the Treasury as a long-term, quasi-permanent, part of the public debt. Particular commercial banks which were experiencing adverse balances at the clearing house might turn in some of their bonds to the Reserve Banks; but, barring a deflationary policy by the Board of Governors of the Federal Reserve System, such sales would presumably be counterbalanced by an increased demand for the bonds on the part of other banks whose deposits were being increased. Both in depression and prosperity the bonds would remain an attractive holding for commercial banks, thereby contributing to a greater stability in the volume of deposits. They would be necessary for credit expansion during upturns and they would be desirable as a riskless, perfectly liquid, interest-bearing investment during recessions. Even if a drain of cash from the banks generally, which would properly be offset by ordinary open-market operations, caused substantial sales of the bonds to the Reserve Banks at some particular time, the latter would not be expected to present the bonds in turn to the Treasury for redemption unless the Reserve Board contemplated a more than temporary contraction of deposits.

Because these bonds would be long-term bonds from a Treasury standpoint and demand obligations from the standpoint of any insured commercial bank, the Treasury could enjoy a significant saving in interest costs. The rate suggested here would divide this saving with the commercial banks. The rate of 1½ per cent would be substantially lower than that at which the Treasury can at present borrow long-term funds; yet it would be about three times the current market yield

on the average of 3–5 year Treasury notes. The Treasury would gain further by the removal from the regular part of the public debt of some $15 billions of its present obligations; for with such removal there would be eliminated all the refunding operations that would otherwise be necessary with respect to this part of the public debt.

(4) The Treasury (and ultimately the taxpayers) would be enabled to realize a substantial saving in interest costs by investing the inactive portion of the Stabilization Fund in ordinary Government obligations without thereby increasing the actual or potential volume of bank deposits by more than the face amount of the expenditure. Similarly, the monetization and expenditure of the Treasury's silver bullion holdings would no longer involve a several-fold multiplicative effect upon the potential volume of bank deposits.

CONCLUSIONS

A great many persons in recent years have lost their faith in the efficacy of monetary policy as an economic cure-all. That is a good thing. It was an exaggerated faith. For one thing, it rested upon too narrow a view of the world of monetary phenomena. Today it is easier to recognize that a great many factors which were previously thought of as outside of this sphere, such as public receipts and expenditures, private investment activity and even the general political atmosphere, may have very important monetary effects. In this broad sense, the field of monetary policy extends over a large part of the whole domain of public policy.

In the narrower and more traditional sense there remains considerable difference of opinion as to the positive objectives of monetary policy and the technical means of achieving them. But there is little disagreement about certain kinds of monetary disorders that we should like to avoid. One of these is an undisciplined and uncontrolled expansion of bank credit. Further, a goodly measure of control over the volume of money and credit would seem to be indispensable for the achievement of any positive objective of monetary policy.

It is in this sense that the problem of excess reserves may be regarded as the major monetary problem confronting the country. The traditional methods for handling it are, as we have seen, quantitatively inadequate, and, in view of the large holdings of Government securities by banks, difficult to apply. An early reduction in excess reserves through gold outflows seems less likely than further increases. Although quiescent at present, it is not a problem that is likely to solve itself.

An adequate solution would require new legislation. Some five pos-

sible lines of attack have been indicated in this paper. No one of them is wholly free from difficulties—but the present situation is itself full of actual and potential difficulties. Two, in particular, of the methods outlined above appear to merit study and consideration. These are: the establishment of the power to impose very high reserve requirements—something between 50 and 100 per cent upon *increases* in demand deposits occurring after a cited date; and the imposition of additional reserve requirements in the form of a special issue of Treasury obligations which, initially, would be exchanged for the bulk of the existing bank holdings of Government securities. The latter method, though more complex, appears to possess additional advantages of great importance to the banking system and the Treasury.

ACTUARIAL PROBLEMS IN SOCIAL INSURANCE*

By Reinhard A. Hohaus
Associate Actuary, Metropolitan Life Insurance Company
President, American Institute of Actuaries

A very encouraging aspect of the brief history of social insurance in this country has been the critical reconsideration by both public and private agencies of the basic principles involved. This is as it should be, because a social insurance plan must serve social needs first of all, and accordingly it should be so constructed or reconstructed as to direct its resources, whatever they may be, to best serving these needs.

In attaining this fundamental objective, however, attention must also be continually focused on the no less important problem of keeping the costs involved within the means that are, or may reasonably be made, available. Indeed, the long-term cost of a social insurance scheme will be a controlling factor in determining its staying power. The plan must not entail unduly heavy burdens on society in the long run, for if it does, it may eventually have to be radically modified or face collapse—either consequence carrying the seeds of socially most unfortunate repercussions.

Actuarial problems in social insurance, like those in private insurance, relate mainly to the important task of cost estimation. The actuary's work in social insurance, however, is in the main confined to the expenditure—the outgo—side of the "cost" concept. The financing of the cost of a social insurance plan—the means of raising the necessary income—is primarily a matter of fiscal and public policy which is not strictly an actuarial problem, but rather one involving the fields of sociology and of economics, and more especially, public finance. Accordingly, I intend to discuss some of the broad actuarial phases of forecasting the "expenditures" under our social insurance plans—the Federal Old Age and Survivors Insurance Plan and the system of state unemployment compensation plans—and to indicate the kind of statistical data that may be required for such forecasting.

GENERAL PROBLEMS

The technical characteristic of social insurance which is probably most striking to the actuary trained in private life insurance is the lack of knowns. Though he is accustomed to estimating costs in private life

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insurance, which in itself implies working with unknowns, his forecasting there is generally limited to fewer fields than is that in social insurance. Conducted on a contractual basis, the insurance company agrees, in return for specified premiums, to pay to or on account of a given individual a certain amount of insurance on the occurrence of the risk insured against. The actuary thus deals with a "closed group" of insured. He knows the number of insured; he knows considerable about the individual insured—their age, their health classification at entry into the insured group, etc.; he knows the amount and terms of insurance contracted for.

With these known factors and his knowledge of the use of mortality tables, it is not very difficult for the actuary to estimate the risk the insurance company may assume with regard to an individual or a homogeneous group of insured. Given their age and risk class, he applies appropriate mortality rates to determine what risk the insured would be likely to represent to the company at the various ages through which they may pass in the future. To this forecast discounting calculations are applied on a conservative interest rate basis, producing an appropriate present value of the liability incurred by the insurance company. The premiums are determined next as either the lump-sum or single premium or, more often, the level series of annual instalments or level premiums which, when discounted to take account of interest, will equal the present value of the company's liability. Finally, the premium calculations are adjusted to provide margins for expenses and contingencies. Because these procedures are applied in the case of each age class and risk class of insured, the present value of the liability of each insured is offset by the present value of his premium payments. It follows that, collectively speaking also, increases in the prospective liabilities through additions in the number of insured or in the amounts of insurance contracted for by the company are counter-balanced by appropriate increases in the prospective assets through additions in premium income.

The unknowns involved in these calculations relate to the future experience as to mortality, investment income, and expenses. These are elements regarding which extensive experience is available and which normally do not change erratically over time; and accordingly their trends, dealt with conservatively, may be forecast satisfactorily. Thus, the entire forecasting process in private insurance is based on facts and on experience which, if projected with due caution, may be considered reasonably indicative of the future.

"Open Group" Forecasting. When working with social insurance, the

actuary treads on much more uncertain ground. There are many more unknowns to be coped with. In this field, he must deal with an "open group" instead of a "closed group" of insured. Coverage under our social insurance plans is a function of employment covered under the plans An individual's coverage is effected through his working in a covered job; whoever had the job before him and whoever may have it after him will likewise be covered. The job, in other words, determines the coverage—not the individual—and shifts into and out of covered employment must therefore be taken into account. Accordingly, the actuary must reckon with an "open group" of insured which includes not only those identified individuals who are or have in the past been working in the occupations and industries covered under the plan, but also those as yet unidentified individuals who may be working in them in the future.

Uncertain Amounts of Benefits. Moreover, our social insurance plans do not require continuous membership as a prerequisite to eligibility for benefits. Benefit rights are based on the wages received and the period spent in employment in the covered occupations or industries. Also, the benefits provided are not absolute amounts. They are determined, when application for benefits is made, by formulas which are based on the total wages and period of coverage. In addition, they recognize the social adequacy principle, and hence involve a gradation favoring the lower wage classes. Forecasting for our Federal Old-Age and Survivors Insurance Plan is further complicated largely by (1) the indefiniteness of the actual retirement age of the insured, and (2) the provision of certain dependents' and survivors' benefits which are contingent on the age and other factors relating to the dependents or survivors as of the time of the insured's retirement or prior death.

Future Changes of the Plan. Another striking characteristic of social insurance plans grows out of the fact that they are legislative measures designed to meet a social need as determined by prevailing social thought. Being legislative measures, they are subject to unpredictable future modifications of a political nature. Being at the same time social measures, they are inherently dynamic and likely to be changed with the times. The impossibility of foretelling future economic and social conditions, of course, hampers (if it does not preclude) reliable forecasting as to the manner in which the coming years and decades will affect the plans. The only thing we do know already from our own experience—not to speak of the many foreign precedents—is that changes in our plans are almost sure to be made and that we must do our best to be prepared for them. In addition, therefore, to the above

technical contingencies which reduce the reliability of actuarial projections for social insurance plans, the actuary is confronted with a very fundamental doubt as to the continuance of these plans on the existing bases.

Because of all this, the actuary faces a very peculiar situation in social insurance. While his work in this field may be much more difficult and more extensive than his task in private insurance, the results he produces in the former are, by their very nature, much less dependable than those he obtains in the more definite private field. It should be borne in mind, of course, that the seriousness of the effect of the contingencies in social insurance depends, in large part, on the particular kind of scheme on which the actuary is working. In a long range plan, like our Federal Old-Age and Survivors Insurance Plan, they obviously play a very crucial role, because the longer the period for which actuarial planning is necessary, the less are the basic premises to be depended upon. Conversely, it follows that in an essentially short-range program—such as one dealing with the risk of unemployment calculated, at most, to cover a complete business cycle—the long-range factors discussed above are of less importance. However, to avoid unwarranted optimism, I must not postpone mentioning that unemployment presents certain additional problems (to be referred to later) which make this field perhaps even more dangerous from an actuarial point of view than that of old age and survivors' insurance. In all social insurance plans, therefore, is constant vigilance necessary to adjust and revise such errors of actuarial judgment as may become apparent with the passing of time.

STATISTICAL REQUIREMENTS

The general nature of social insurance—and especially the many unknowns involved—naturally compel the actuary to be well fortified with a very broad knowledge of social and economic conditions. Where in forecasting private insurance costs he must make assumptions primarily with regard to future mortality, investment income, and expenses, in social insurance he must make many additional assumptions concerning the future of such less predictable elements as employment, wages, family composition, etc. To do this to the best of his ability, he will have to have at his disposal appropriate detailed information on all such social and economic factors.

Old-Age and Survivors' Insurance. What, then, are some of the more specific actuarial problems requiring statistical treatment in our Federal Old-Age and Survivors Insurance Plan?

The cost of our social old age and survivors' insurance plan will depend mainly on the following factors: 1) coverage, 2) benefit liabilities, 3) expenses, and 4) future changes. Obviously only the first three of these are subject to any statistical treatment and forecasting. The only policy that may and should be pursued with regard to the fourth element, "future changes," is to aim at always having the plan on a currently sound basis—so that such amendments as may be proposed from time to time might be evaluated in terms of an existing sound program. Moreover, so far as the "expenses" of the plan are concerned, no major actuarial problems seem to be involved. Helpful experience will probably be forthcoming soon after all the phases of the plan begin to become operative in 1940. Hence the following discussion will be confined mainly to the two factors concerned with *coverage* and *benefit liabilities.*

Coverage. Approximating the long-term coverage (the number of workers covered) under an old age insurance plan, limited in its scope to certain classes of the working population, entails the determination of present as well as a forecast of future coverage. Present coverage is relatively easy to ascertain. A review of existing employee accounts with the Government with this end in view ought to yield the proper figures.

Future coverage, on the other hand, is much more difficult to estimate. As already indicated, an "open group" technique must be employed to take account of future entrants into the plan. Moreover, since coverage is essentially a function of the length of time spent in jobs covered under the plan, future coverage will depend not only on the prospective variations in the number of persons in such employment but also on the duration of their work in such employments. Accordingly, the actuary's problem in this connection is greatly complicated by his having to reckon with the uncertain effects on future coverage of intra- and inter-industrial shifts of workers.

Coverage forecasts must thus be based on the best possible knowledge of certain trends in our general population and related factors, in our working population and its occupational and industrial distribution, in population and labor migration, etc. The coverage problem, in short, involves forecasts of future population characteristics. Therefore the actuary's basic statistical requirements include data along the following lines:

1. Birth and death rates—by years
2. Migration into and out of the country—by years
3. Population—classified by:

a. Age
b. Sex
c. Race
d. Industry—with certain occupational breakdowns and data relating to duration of, and shifts in, covered employment.

The Benefit Liabilities. Estimates of benefit liabilities under our social old age and survivors' insurance plan are based mainly on two elements. One, which is a familiar field to the actuary, is the probable mortality of the covered group—the primary insured and their dependents or survivors who may also qualify for benefit. The other involves estimates of the probable amounts of benefits payable to those who survive, and the basis therefor results in a number of new problems for the actuary.

The annual expenditures on benefits will equal the sum of the amounts payable to the primary insured and the combined amounts payable to their dependents or survivors (qualified wives, widows, children, and parents in certain cases). The amount of the primary insurance benefit payable or accrued with respect to an individual insured is a function of covered employment to retirement or prior death—of the wages received for that employment—and is therefore an indeterminate amount until the benefits actually become due. The amount of the individual benefits to dependents or survivors, in turn, is based on the primary insurance benefit. Their actual payment, however, will depend on such factors as 1) the family and economic relationships of the dependents or survivors, if any, to the primary insured and to each other, 2) the dependents' or survivors' age, 3) their number, 4) their marital status, etc.—all taken as of the time the risk insured against materializes (i.e., when the primary insured dies or retires under the plan). Moreover, aside from mortality, the duration of the old age benefits payable to a primary insured (and his wife) will naturally be affected also by his age when he retires and his benefits commence, i.e., whether he is then 65 or over.

These factors reflect mainly social, economic, and personal conditions concerning which the information now available to the actuary is far from adequate. While calculations involving assumptions as to their future behavior will naturally be subject to decided reservations at all times, detailed statistical knowledge of the past will be indispensable as a guide to making the assumptions as reasonable and reliable as possible. Indeed, the greater this knowledge of the past, and especially of trends which may indicate the future, the more confident will the actuary feel as to his forecasting work.

An important part of the record of the past will be furnished by the statistics necessary for coverage estimates: namely, the volume and character of the employment in the covered occupations and industries. Other statistics needed for this purpose might be obtainable largely from the individual records produced by the workings of the plan. These will probably have to include data on:

1. *Wages.* The wages received for covered employment—classified by:
   a. Wage classes
   b. Industry—and certain occupational breakdowns
   c. Attained age
   d. Sex
2. *Age of Retirement.* The rate at which insured individuals retire from covered employment at various ages. This may have to be classified, among other things, by:
   a. Sex
   b. Wage classes
   c. Marital status
   d. Industry—and certain occupational breakdowns
3. *Family Composition*—with special emphasis on data as of the time of the primary insured's retirement and death.
   a. The age of the primary insured
   b. The individual members of his immediate family (wife, children, and parents)—classified by:
      i. Age
      ii. Family relationship to primary insured
      iii. Marital status
      iv. Other factors determining their benefit status

On the basis of such statistics, covering an appropriate period of time, one or more sets of reasonable assumptions regarding the future of the variable factors involved might be made. Then appropriate long-term projections (by years) could be undertaken of: birth and death rates, migration, covered population and working population, annual rates of wages and their variation by attained age, changes in wage levels, labor migration, unemployment, retirement, death, and family composition. Such projections are essential for forecasting the coverage and the benefit liabilities of the plan, and with them available the actuary could then proceed with the work of actually estimating the future benefit expenditures.

Owing to the nature of most of these actuarial factors, however, the reliability of such social insurance forecasts will always be open to question. Hence it may well become accepted practice in this field to follow the precedent set by the Actuarial Consultant of the Social

Security Board of presenting *minimum*, *intermediate*, and *maximum* cost estimates. This, indeed, would seem to be the conservative thing to do. Since the reliability of the forecasts is bound to vary inversely with length of the period covered, such a procedure would appear especially desirable for long-term prognostications.

Unemployment Compensation. Unemployment compensation does not involve a risk that will take many decades to materialize. On this score, therefore, the layman may at first consider satisfactory forecasts to be more readily obtainable in this field than in that of social old age and survivors' insurance. As hinted at before, however, this is not the case. The actuarial element which greatly complicates unemployment compensation plans is the risk of unemployment itself.

The risk of *involuntary unemployment*—the main risk against which protection is sought in unemployment compensation plans—may be divided into three components: *seasonal*, *intermittent*, and *cyclical* unemployment. *Seasonal unemployment* is that which recurs annually as a result of the seasonal movements which pervade our economic system. Therefore, by definition, it is rather predictable within broad limits, though in the practical operation of unemployment compensation plans it introduces some serious problems. *Intermittent unemployment* is that caused largely by natural labor turnover and by technological displacement. This, too, is not a source of great technical concern to the actuary. Not only does it seem less important in the long run than the third type—cyclical unemployment—but there is reason to believe that, with adequate statistics and other information, helpful trends and experience may offer some basis for projecting it for reasonably short periods ahead.

Cyclical unemployment presents the greatest actuarial problem in unemployment compensation. Its magnitude and character make it so. It is very largely an economic risk arising from and corresponding to the large cyclical fluctuations of the economic system. However, one of the characteristics of business cycles appears to be that their patterns are generally not very much alike and, so far as I know, no dependable method has yet been developed for forecasting their timing, intensity, and duration. Hence, attendant cyclical unemployment is largely in the nature of a catastrophe hazard of which very little is known that would help in estimating its future incidence. This is all the more the case when, as in unemployment compensation, this type of unemployment must be measured on a statewide (instead of a national) basis.

It is very doubtful, therefore, whether the cost of unemployment

compensation lends itself to actuarial forecasting. The most the actuary seems to be able to do is to take past experience and, in determining the cost, assume more or less that the future will behave like the past—an assumption which, when it comes to the problem of forecasting cyclical unemployment, is of especially doubtful value. His function in this field may therefore have to be confined to recording past and current costs and to interpreting what this or that proposal for changes may seem to mean (relatively) in terms of such costs.

In addition, then, to most of the factors involved in and the data needed for forecasting the costs of social old age and survivors' insurance, cost calculations for state unemployment compensation plans will naturally also require state breakdowns and as much statistical information as possible concerning the risk of unemployment itself. The following, classified by state, industry and certain major occupational groups, age, and sex, would probably be among the data needed for this purpose:

1. Volume of and fluctuations in employment
2. Volume of and fluctuations in unemployment
3. Duration of unemployment
4. Spells of unemployment within the year
5. Reasons or causes of unemployment
6. Inter-state migration of labor

The foregoing has attempted to give an indication of some of the actuarial problems requiring statistical treatment and the kind of statistical data that may help in the solution thereof. I have by no means presented a complete research program; that requires a very intimate knowledge of the problems involved and, therefore, the experience of those directly engaged in the social insurance field.

To round out the picture from the point of view of basic data, for example, reference might well be made to studies on such questions as the proportion of the beneficiaries who become employed and hence have their current old age or survivors' benefits suspended. Likewise, in the field of unemployment compensation, I might have mentioned the importance of "size of firm" statistics to determine the effect of the exclusion from coverage of establishments having few employees. Moreover, any complete discussion of statistical requirements would presumably have to include certain details regarding the various statistical techniques that might be employed to get the required data. These should probably be examined to determine the best method(s) of obtaining each of the items of information sought—whether through sample studies (which would of course raise important problems con-

cerning sampling procedure), through censuses, through the wage and tax records developed, or through other possible channels.

In conclusion—a general word regarding actuarial forecasts for social insurance. It has been amply demonstrated that the actuarial problems in this field (in old age and survivors' insurance as well as unemployment compensation) involve going much more into the seas of the unknown than do those connected with private insurance. They lack the reliability of private insurance forecasts, and frequent reviews and revisions of them will be necessary to keep them as indicative as possible of the future. Indeed, as I expressed myself in a paper presented to the American Institute of Actuaries:

> Too often, it seems, are social insurance forecasts of decidedly limited value assumed to represent reliable estimates valid for many decades hence. That this is an assumption founded largely on unwarranted and misleading optimism is rather clear, since no one can really tell much about the distant economic and social forces which will ultimately control a plan. Forecasts are, of course, indispensable. Yet it is no less essential to know how to use them than it is to have them. They can and should serve as guides to what the future *may* hold in store—as a means of charting a *possible* course of a plan. But ample allowance should be made for the possibilities both of errors in judgment and assumptions and of the occurrence of unexpected adverse contingencies.[1]

However, just because so many uncertainties shroud the future of any particular social insurance plan, it is all the more desirable that actuarial forecasts be made and that conservatism be the guiding philosophy regarding its quantitative provisions. While the actuary may not be able to tell how much a plan will cost in the future, he can tell what it *might* cost; and if that possible cost is likely to be too great for the nation to bear, it is the part of wisdom to reduce the benefits under it to fit more reasonably within the country's capacity to afford it. The serious social repercussions likely to be experienced if the upkeep of a plan rises beyond society's reasonable "ability to pay" far outweigh the more or less illusory advantage of temporary liberality. And so it becomes the prime responsibility of all of us in the professions and fields that touch on our system of social insurance to obtain the facts and interpret them and their long-range implications to the American people. We should distribute this knowledge widely in order that the developments in social insurance will promote the safe passage of the nation over the near and distant years ahead.

[1] "Equity, Adequacy, and Related Factors in Old Age Security," *The Record of The American Institute of Actuaries*, Vol. XXVII, June 1938, p. 92.

STATISTICAL METHODS AS APPLIED TO CASUALTY INSURANCE*

By Mark Kormes
Assistant Director of Organization and Training
The State Insurance Fund, New York

The advent of the automobile and the introduction of compulsory workmen's compensation insurance legislation gave a tremendous impetus to the business of casualty insurance. In the past quarter of a century it has grown and developed to take an important place among the leaders of our industrial empire. During the calendar year 1938 casualty insurance companies wrote a premium for the various lines aggregating approximately $1,200,000,000.

If one considers that there is hardly a phase of our life which is not covered by some type of insurance designed to remove the fear of uncertainty and to protect the individual or a business venture against the occurrence of an adverse event, be it a small accident or a catastrophe, one need not wonder that in order to succeed insurance companies had to develop a vast amount of information to guide them in the determination of adequate insurance charges. On the other hand, supervisory state authorities are also deeply concerned that insurance rates be not only adequate, but also reasonable, and for certain types of insurance non-discriminatory as between the various policyholders. The insurance departments in many states require the filing of voluminous data of statistical nature in support of rate schedules and for certain lines an approval must be given before any rate schedule becomes effective.

In consequence a wholly new profession sprung to life, namely that of the Casualty Insurance Actuary. The Casualty Actuarial and Statistical Society, organized by 97 charter members in 1914, has grown to a present membership of over 300 Fellows and Associates. Although the word "statistical" has been eliminated from the name of the society, the organization remains the central point for exchange of ideas and its proceedings are replete with statistical analyses and studies covering the various phases of the casualty insurance business.

In view of the vast material—one need only refer to some twenty-five volumes of several hundred pages each containing the essence of the progress made in statistical and actuarial methods in casualty insurance—I cannot expect even to scratch the surface in the short

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period of time allotted to me. I shall, therefore, limit myself to the description of certain phases of statistical methods as they apply to the business of workmen's compensation insurance, not only because I am most familiar with this line, but also because it is one of the largest lines, with a premium volume in 1938 of over $340,000,000. The problems in this line have been most acute and their solution has led to methods which *mutatis mutandis* have been applied to other casualty lines.

In the first place may I be permitted to bring out a very salient feature which has added considerably to the ability of the statisticians and actuaries to evolve successful methods to cope with the problems. The multiple line writing casualty insurance companies can hardly develop individually a sufficient volume of experience to satisfy the "Law of Large Numbers" unless they were to accumulate the data for a very long period of years. Such data, however, would be of little, if any, value because the circumstances and conditions under which certain events occur change rapidly in modern life. Thus, it came about that casualty insurance companies have banded together for the purpose of pooling their information, combining their experience for relatively short periods of time and developing the statistical data on which to predicate a rate structure. In addition to the various boards and bureaus dealing with compensation insurance notable mention should be made of such organizations as the National Bureau of Casualty and Surety Underwriters, which serves as a ratemaking body for the stock insurance companies in practically all lines; the Mutual Association, a similar organization serving the interests of the mutual companies; the Towner Rating Bureau, a rating organization for the fidelity and surety business, and, last, but not least the National Council on Compensation Insurance, which co-operates with the individual state boards and bureaus toward applying a uniform ratemaking method to workmen's compensation insurance throughout the United States.

The various rating organizations have issued more or less elaborate statistical plans governing the submission of the data for ratemaking and analytical purposes. For some lines of insurance the data are submitted summarized by classifications, states and rate territories. For other lines a copy of the punched card is submitted for every transaction transpiring in the companies' offices and still in other lines a policy history report is prepared. The policy history report is at the present time used quite extensively in connection with workmen's compensation insurance.[1] It consists of an individual report on every single

[1] See references to literature following the text.

policy issued by a given carrier, showing the audited payrolls for each classification, the rates applied and the premium charged, as well as a listing of all cases on which compensation was paid by claim number and date of accident and showing the classification of injury and occupation as well as the incurred compensation and medical cost on such claims. Claims involving only medical payments may be lumped together by classification of operations. This method was introduced primarily in connection with the problem of the small risk, because the experience of individual companies indicated a considerably higher loss cost on such risks as compared with risks developing a substantial premium volume. The information so reported is transferred by the rating organization onto punch cards which permit not only an analysis of the experience by classifications of operations and injuries, but also many other interesting statistical investigations.[2] In this manner it was possible to develop a consistent and scientific method of calculation of the loss cost differentials for large and small risks[3] and to solve a number of problems arising from time to time in connection with individual classifications.

As stated before the primary purpose of collection of statistical data in casualty insurance is the determination of rates. It might be well at this point to explain briefly the component parts of the compensation rate without going into the intricate details of the ratemaking procedure. I would like to state that the rate is composed of two portions, namely the net cost or the so-called pure premium, and the expense loading. The expense loadings are determined by the actual expenses incurred by the stock companies, but have been held practically constant by the insurance departments as for example in New York at the level of 40 per cent of the premium dollar. The pure premium is the loss cost per hundred dollars of payroll in a given classification. The loss cost is, of course, a product of the claim frequency and the claim severity and you will, therefore, recognize the familiar definition of a mathematical expectation. Without going into the details of the determination of the loss cost, I would like to bring out the necessity for adjusting the raw experience to reflect the changes in conditions that took place since such experience has been incurred. Thus, it becomes necessary to make a projection in the medical losses to recognize the rising trend of the cost of medical treatment. The method of least squares was utilized in this connection for a number of years. It is necessary to make adjustments to reflect the changes in the benefit provisions of the Law and it is necessary to adjust for the rising liberality of industrial commissions and courts as respects the interpretations of the provisions of the compensation acts.

Last, but not least, it is necessary to examine whether the volume of experience in the state is sufficiently large to produce reliable results, and if such is not the case to borrow in part or in whole from the experience for all states combined as adjusted to the benefit level of the given state. This introduces a highly technical application of the theory of probability to casualty insurance in the form of "credibility formulae."[4] All this sounds very complicated and it is even more complicated in actual practice. Numerous papers have been written on this subject and continuous efforts are being made to make improvements and to meet the problems which arise almost daily.

In the workmen's compensation ratemaking procedure there are a number of important considerations which have led to various statistical analyses and I have selected several elements entering into the ratemaking procedure which will illustrate the nature of our problems and the statistical approach which has been developed.

In the first place, we have the problem of law amendments. This problem has been given considerable attention by the casualty actuaries in the early days of compensation insurance and is still playing a very important part in the ratemaking structure. If one considers that New York compensation rates on July 1, 1938, were 93 per cent above the level of the rates on March, 1917, and that the increase would have been only 40 per cent were it not for modifications of the law, one will appreciate the tremendous importance attached to the valuation of law amendments. The effect of a change in the provisions of the law on the cost of compensation is tied up with the problem of wage distribution, the factors arising out of the minimum and maximum limits of benefits, and finally with the problem of the distribution of accidents by types and duration. This brings us to a notable achievement, namely the so-called American Accident Table prepared by Miss Outwater[5] in 1920 as contrasted to the Standard Accident Table compiled by Dr. Rubinoff from European accident data. The construction of this table was based on several hundred thousand accidents taken from the early workmen's compensation experience in a number of states. In the preparation of the table a number of assumptions had to be made and statistical adjustments, such as graduation processes, introduced. Finally the total distribution was reduced to a matrix of one hundred thousand.

A study of the distribution of the accidents by type of disability brings out the interesting fact that the American Accident Table approximates very closely the results of the Standard Accident Table based on European data. The American Accident Table contains also distribution of fatalities according to the type of dependents and the

number of dependents as well as a distribution by duration in weeks both for permanent and temporary disabilities. The short time does not permit me to go into the details as much as I would like to. Reference to the proceedings of the Casualty Acturial Society will enable anyone interested to find out not only how the table was constructed but also how it is being utilized at present for the valuation of law amendments.[6] I would like to add that although it is doubtful whether the distribution in the table is typical of conditions in any one state, it is based on a larger volume of experience than that available in any one given state and at least one check was made which disclosed that the table is essentially correct. It might be advisable to reexamine the situation again in the light of most recent experience.

As mentioned previously certain wage statistics are necessary and special calls are issued periodically by the National Council on Compensation Insurance requiring the insurance companies to submit actual data on the wages paid to injured workmen. This information is utilized in the calculation of "limiting factors" needed because of the maximum and minimum provisions in the laws.

Another element in the determination of law amendments, and for that matter claim reserves, is the computation of the present values of future benefits payable to widows and other dependents as well as to permanently disabled employees compensated for total or partial loss of earnings. Thus, for example, in the State of New York the Compensation Law requires that the present values on death benefits be based on the Danish Survivorship Annuitants Mortality and the Dutch Royal Insurance Institution Remarriage Tables. Naturally the question arises whether the remarriage rates contained in the Dutch table reflect the conditions existing in this country and whether they are not affected by the passage of time. Under the auspices of the Casualty Actuarial Society a special committee conducted a study as a result of which an American remarriage table was constructed. The preparation of this table required not only an accumulation of a large volume of statistical data, but also careful analysis of such data and a considerable study of appropriate graduation methods to produce smooth results.[7]

The computations were made on the basis of over 10,000 reports, and tables were constructed not only for the remarriage rates at the age of entry, but also for the remarriage rates for each of the first six years of widowhood, because the study disclosed that the remarriage rate varied more with the duration of widowhood than with the age of the widow. It is interesting to note that the probability of remarriage is greatest during the second year of widowhood practically for all

ages. The mortality rates for white females obtained from the U. S. Life Tables for 1910 were slightly adjusted and combined with the remarriage tables to obtain complete expectations of unmarried life. It was found that the complete expectation under the American Table is greater for the younger ages and lower for the older ages when compared with the complete expectation based on the Dutch Remarriage and Danish Mortality. The turning point is approximately at the age of 34. Therefore, reserves set up on the basis of the American Table will be greater for the ages less than 34 and lower for the ages over 34.

The valuation of permanent total disabilities and permanent partial disabilities where the benefits are payable for life is made from tables based on the Danish Survivorship Annuitants Table of Mortality. A natural question arises as to whether the mortality among disabled lives is not in many ways affected by the nature of disability. A committee was recently appointed by the president of the Casualty Actuarial Society to study this problem. The first task of the committee was to assemble a large volume of data on permanent total disabilities by issuing a special request to the insurance carriers throughout the country. The data are now being tabulated and will be studied according to the type of disability, sex, geographical location and possibly in other respects depending upon the indicative value of the experience under a given subdivision. The results of the investigation will not be available for another year.

I have thus in broad strokes outlined several important developments in connection with the valuation of the law amendments from the early beginnings of compensation insurance up to the present time.

The flexibility of the method of reporting the experience on policy unit basis has been further demonstrated in connection with the studies underlying the widely advertised retrospective rating. The basic idea of this plan is to furnish the assured with insurance protection for excess loss cost over a given loss ratio and to charge him the full cost of all losses up to the given loss ratio plus the necessary expenses. In order to arrive at the insurance charges for the losses in excess of a given loss ratio an elaborate statistical analysis had to be conducted. In this study not only the actual risk loss ratio had to be considered but also size of the premium, as it was found that the losses in excess of a given loss ratio are related to the premium size.[8]

In addition to the policy history report, the unit statistical plan also calls for the submission of individual reports on open cases, that is cases on which the insurance carrier is still making payments or else where the extent of liability has not been fully determined at the time of reporting. These individual reports of losses on death cases give all

the necessary data as to the number and ages of the dependents, as well as the wages earned by the deceased employee, and on permanent disability cases show the age at the date of injury and other pertinent information. Among other uses this information permits the study of losses in excess of a certain value. As you most probably know there are insurance carriers granting re-insurance coverage over and above a certain cost per accident and there are a number of so-called self-insured risks which purchase only such excess insurance. You can see, therefore, that it is rather important to be in a position to develop adequate rates for this type of insurance.[9] If we bear in mind that the re-insuring carrier or the excess insurance carrier does not commence to make any payments until the amount, say $10,000, over which it insures has been reached, we will realize that it is necessary to calculate the period of time during which $10,000 will be expended and then to calculate the present value of the annuity deferred for such period. Such study is at the present conducted by the New York Compensation Insurance Rating Board and it is hoped that its results when made available will shed considerable light on the rate situation in the field of workmen's compensation excess insurance.

The variation of the provisions in the various state laws give rise to the application of index numbers to represent their relativity. The statistical tool of index numbers is used also to express the changes in the provisions of the law within an individual state as well as the changes in the levels of rates applicable in a given state.[10]

In the reporting of the experience to the central ratemaking organizations as well as in the preparation of annual statements there are a number of claims on which estimates of the incurred cost must be made because they do not involve any definite schedule loss. Such cases, as for example, back injuries, head injuries or internal injuries are grouped under the general heading of indeterminate cases. Studies have been made and tables prepared for the valuation of indeterminate cases. Such tables have been prepared to show an average future duration according to the attained duration of the case at the date of valuation. Subdivision has been also made in accordance with the industrial groups, nature of injury and age.[11] The general feeling, however, with respect to the use of such tables is that the individual estimates of trained claims men are much more accurate and reliable, and because of the fact that the value of claims enters into the calculation of experience modification[12] affecting the rate of individual assureds, the tendency is to rely on claims judgment rather than use indeterminate reserve tables.

Time does not permit me to go into the many phases of statistical

data prepared by individual companies for the benefit of the management such as agency analyses, etc. It will suffice, however, to assure you that the statistician or actuary in a casualty company is beset with demands for information.

In conclusion I would like to say that I hope that the topics I have selected have given you an inkling of the nature of our problems, their magnitude, their multitude, and their variety. I hope that I have stirred among you sufficient interest to refer to the long list of publications contained in the *Proceedings of the Casualty Actuarial Society* dealing with these and allied subjects.

LITERATURE

The references are in all cases to the *Proceedings of the Casualty Actuarial Society*. For each reference mark the titles of papers are shown, followed by the Volume and Number of such *Proceedings*.

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(4) "How Extensive a Payroll Exposure is Necessary to Give a Dependable Pure Premium," by Albert H. Mowbray. Volume I, No. 1.

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(9) "Observations on Making Rates for Excess Compensation Insurance," by Paul Dorweiler. Volume XIII, No. 28

(10) "Index Numbers of Compensation Insurance Rate Levels," by Paul Dorweiler and Nels M. Valerius. Volume XX, No. 42.

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(11) "On Indeterminate Reserve Tables for Compensation," by N. M. Valerius. Volume XX, No. 41.

(12) "The Experience Rating Plan as Applied to Workmen's Compensation Risks" by Mark Kormes. Volume XXI, No. 43 and Volume XXII, No. 45.

MORTALITY TABLES—FINANCIAL MEASURING RODS IN LIFE INSURANCE*

By Alfred N. Guertin, F.A.S., F.A.I.A., A.C.A.S.
Actuary, Department of Banking and Insurance
State of New Jersey, Trenton, N. J.

The measurement of the span of human life and the probability of survival have been fascinating subjects to men from the beginning of time. As civilization progressed, the contemplative arts developed and life became regarded as more precious, men turned their thoughts more and more to the solution of this apparently insoluble question. The outcome was the life table, an instrument which permits the calculation of the probability of death and survival. While men still remain unable to estimate the life term of the individual, it is possible to forecast, with some degree of accuracy, the future development of a given population. Such progress has been made toward detailed classification as to characteristics that measures may now be applied to smaller and more homogeneous groups. In this way, we are given a means of studying the comparative influences of many factors on the probability of death and survivorship according to the varying physical characteristics among differing groups and a means of establishing standards for the measurement of financial risks involving the contingencies of life.

The subject of my discussion today is not one of passing interest. To actuaries, the subject of mortality tables is one of continuous study; to statisticians, the compilation of life tables is a field of considerable importance. There is no essential distinction between a life table and a mortality table, but the difference in the two designations may be indicative of the lack of a common meeting ground between actuaries and statisticians. Undoubtedly, the purpose of your Program Committee, in asking a number of actuaries to address this meeting, was the promotion of a better understanding of the problems common to both groups and the narrowing of that division of ideas which exists between them relative to such problems and of which differences in terminology are merely an indication. To be among those chosen to address you is an honor which cannot be taken lightly.

Mortality tables, or life tables if you please, and the science of life contingencies did not develop without having been associated with famous names. In the seventeenth century, while Blaise Pascal and Christian Huygens, renowned mathematicians, were developing their

* A paper presented at the 101st Annual Meeting of the American Statistical Association, Philadelphia, December 28, 1939.

studies on the theory of probability, Jan DeWitt, Grand Pensionary of Holland, was attempting, without statistical foundation but with a theory as to the rate of mortality, to calculate the values of annuities. It remained for Edmund Halley, more renowned as an astronomer than as an actuary, discoverer of the comet bearing his name, however, to merge the theory of probability, the statistical processes of compiling mortality tables and the actuarial processes involving their use in the calculation of premiums for annuities and insurance. It was his table, the Breslau table, based on studies of deaths in the town of Breslau, Germany, published in 1693, which is endowed with the fame attaching to the table of mortality first bearing the major characteristics of tables now in use.

The mortality table is a comparatively simple instrument. It may be described as a distribution by ages of a stationary population. A stationary population may be described as an ideal population wherein the births are exactly equal to the deaths in any given period of time and the number born each year is constant. From such a table, and with respect to such an ideal population, we may determine the number dying at each age and the number surviving to any higher age. From these we may calculate the rate of mortality at each age, the expectancy of life at any age, the probability of survivorship over any period, whether for single or for multiple lives and many other functions of a similar nature. All these functions have a statistical significance to students of population problems and to others who are interested in following the trends, over finite periods of time, in the changes in these various functions according to tables which are representative of actual populations at various given moments of time.

To the actuary, however, the mortality table is a somewhat different article. It is not an end unto itself, but is a tool which may be used in the determination of those quantities with which he may be concerned in the solution of financial problems. With the application of compound interest, the mortality table provides a powerful method of solution for many problems. Among these are the determination of the pure net cost of life insurance by ages and according to various plans, the determination of the values of annuities upon lives, the calculation of survivorship benefits, the valuation of liabilities of institutions bound by contracts involving life contingencies, such as life insurance companies, fraternal benefit societies and retirement systems. Many other problems where financial payments are to be made on the basis of the contingencies of life yield to this method. The necessity for the calculation of these and many other functions based on mortality and other tables, together with ever present interest, have resulted in the de-

velopment of the science of life contingencies, not an unimportant branch of applied mathematics, the mastery of which is essential in the education of the actuary.

It is this use of the life table and the application of this science which have established the scientific bases which underlie modern life insurance practice, which have made possible the life insurance company as we know it today, and which have been extended into the fields of accident and health insurance, pension funds and social insurance. The actuarial mode of attack in connection with insurance problems is to determine the mortality or morbidity table suitable to the particular problem at hand, to devise a suitable table by appropriate modification of an existing table if no appropriate table exists, to compile a new mortality or morbidity table if necessary, to combine functions based on the table so obtained with an appropriate rate of interest, to apply such additional functions based on such other tables of increment or decrement as may be necessary because of the particular underwriting contingencies involved in the problem and, by the application of appropriate formulae, to calculate premiums, pure insurance costs, reserve liabilities and such other functions as are desired in connection with the solution of the particular problem.

My discussion today, however, is not concerned with the methods used in the determination of these various functions. It is concerned, rather, with the choice of mortality tables properly applicable to valuation problems in life insurance, the restrictions on the choice of such tables established by law or pursuant to law, and the movement presently developing for the casting of greater responsibilities upon actuaries and public officials in these matters by liberalizing the statutes of the various states with respect to valuation standards applicable to the reserve liabilities of life insurance companies.

The states have legislated extensively on this subject and usually prescribe the rate of interest and the mortality tables which must be used in making valuations of this liability. For this purpose, only a few mortality tables will meet the requirements of all forty-nine jurisdictions within the United States and the American Experience table, published in 1868, is the most important of these. While this table does not now represent the mortality expected under its policies by any life insurance company, and this fact is compensated for to a large extent in most of its calculations, the use of this table has given rise to many misconstructions and misunderstandings.

Just what is this policy reserve liability and what are the statutory restrictions? Except among certain classes of impaired lives and other special hazards, the risk of death increases with age, slowly at first

and accelerating rapidly at the higher ages. When an insurance policy is paid for by a level premium, it is obvious that the premium collected each year must be sufficient not only to carry the year's risk but also to meet the inevitable deficiencies in the premium at the higher ages. The aggregate accumulations of all such items, known as the policy reserves, must be maintained intact by the companies at all times and constitute the most important liability item in a life insurance company's annual statement.

While statutory restrictions have been established on the choice of tables which are available for valuation purposes and these restrictions have been established for the protection of policyholders of our life insurance companies, it is maintained by many that, by reason of the rigidities of such statutory enactments, they make difficult the progressive maintenance of proper equity among policyholders of companies. Further, they maintain that these rigidities are of such a nature that they do not permit these financial institutions to develop their business along progressive lines and that they hamper that development along lines consistent with the quantitative changes in the underlying risks assumed under the policies which they issue.

The lack of suitable mortality tables is not and is seldom claimed as an excuse for the use of mortality tables now being used by the companies for valuation or other purposes. There are only a few tables in actual use for purposes of calculating reserves on insurance at the present time, and none are based on recent experience. Several other tables are used in the valuation of annuities. Numerous tables have been developed by actuaries as standards of comparison in mortality investigations, general and special, and with respect to occupations and medical impairments. In addition, the Actuarial Society of America is engaged in a continuous investigation of insurance mortality on standard lives, the results of which are published annually. In Great Britain, a similar process is being carried out by the Institute of Actuaries. Individual company actuaries are constantly drawing off the insurance or annuity mortality experiences of their companies. The study of insurance company mortality is broad, thorough and a subject of continuous observation by actuaries. Ample facilities are available for the compilation of such tables as may appear necessary at any time for valuation of policy reserve liabilities or for any other purpose.

Let us consider for a moment the uses made of mortality tables by life insurance companies. These may be classified under the following broad purposes: (1) the calculation of premium rates for insurance policies and annuities; (2) the calculation of non-forfeiture benefits on lapse or surrender of policies; (3) the valuation of insurance and

annuity contract liabilities; (4) the calculation of gains and losses from underwriting operations; (5) the calculation of dividends on participating contracts; (6) the fixing of standards of measurement in studying mortality experience and, closely related thereto, (7) the designation of standards of mortality for the underwriting of new business. Corresponding uses are made of mortality tables or morbidity tables, if applicable, in connection with annuities, accidental death and disability benefits, deferred settlement options and other related benefits.

In the use of tables for most of these purposes, the actuary ordinarily has an entirely free hand and may bring to bear on the problem such theoretical and practical considerations as he may think proper. He may choose such mortality bases for calculating premiums as are dictated by his best judgment based on the appropriateness of the rates of mortality shown thereby as measures of the anticipated mortality. He may, in his best judgment and in accord with experience, choose the proper mortality table for the calculation of dividends. He may determine the proper tables for use as standards in investigations of mortality experience or as underwriting standards. However, only within certain limitations, similar to those applicable in the choice of a valuation table, may he determine the appropriate mortality bases for the determination of non-forfeiture benefits to be granted on default in premiums. Further, when the determination of a suitable table for policy reserve valuation purposes is required, the problem of statutory bases presents itself.

In this country, most states have not seen fit to permit either the insurance commissioner, the insurance companies or their actuaries to determine the mortality table or the rate of interest to be used in calculating policy reserve liabilities. In this matter, our practices differ from those of other countries. Nearly every state has specified a particular table of mortality and rate of interest on the basis of which such liabilities shall be determined. Where complete freedom rests in the company actuary to choose his tools in most other respects, the state steps in and says: "When solvency is involved, the basis of computation shall be this!" Fortunately, such bases are sufficiently uniform among states so that a single basis of valuation can be found which will satisfy all states. While the statutes of the individual states do not, in themselves, specify the reasons for their enactment, their purposes may readily be seen from their text and from the related provisions of the laws.

The states, in designating specific mortality tables and interest rates, were apparently desirous of accomplishing certain objectives. These may be enumerated as (1) the fixing of a uniform basis for the valuation

of policy and other contract liabilities, (2) the establishment of requirements which will result in the charging of premiums which are reasonably commensurate with the risks assumed, (3) the fixing of nonforfeiture benefits granted on default in the payment of premiums by the policyholder, or on surrender of the contract, on an equitable and logical basis, (4) the establishment of measuring rods which will facilitate the appraisal of the progress of the companies from year to year, (5) the fixing of a measure which will tend to the maintenance of equity among the various groups of policyholders as to costs and benefits, and (6) the fixing of a standard which will tend to maintain equilibrium between the operating requirements of the business and the amounts available for distribution as dividends to policyholders and stockholders. How well the present laws satisfy these purposes and how they might be satisfied better were made subjects of inquiry by the special Committee to Study the Need for a New Mortality Table and Related Topics, whose report was recently adopted by the National Association of Insurance Commissioners, of which it was my privilege to be Chairman, and on whose report I have leaned heavily in the preparation of this discussion.

There is considerable misconception with regard to the effect of the use of mortality tables presently permitted by law on the interests of policyholders. It is not unusual for us to meet well-educated, well-informed, intelligent people who are of the opinion that the use of modern mortality tables in place of the classic American Experience table would make large reductions in the cost of insurance to policyholders and that companies are anxious to continue the use of obsolete tables. Some time ago I had the privilege of taking luncheon with the pastor of one of our local churches, well known nation-wide as a speaker on a coast-to-coast broadcast, who had recently been discussing, with a study group at one of the large eastern universities, certain current problems which included the mortality and interest bases underlying life insurance. Apparently, he had learned of the creation of the special committee to which I have referred. His greeting to me was: "Well, I understand you are going to make life insurance companies charge lower premiums! Apparently, the public is going to get a break." Considerable analysis is necessary to show that, in spite of the current use of valuation standards based on mortality tables compiled many years ago, companies are able to make such adjustments in their calculations that the cost of insurance to policyholders represents substantially the mortality cost to be actually expected rather than the tabular mortality costs developed by the American Experience table and that the

changes in company-policyholder financial relationships as a result of changes in the mortality standard are likely to be minor rather than major.

A brief explanation on this point would probably not be out of order. The premiums collected from policyholders and the interest and dividends received on investments constitute the normal income of a life insurance company. Its normal disbursements consist of policy claims, surrender values, expenses and dividends. In addition, the income must provide for the increase in policy reserves each year. This increase may be either positive or negative. The earnings of the company in any year will consist of the difference between normal income and disbursements less the increase in reserves. Since a change in valuation standards will not change income and disbursements, except in a very minor aspect with reference to surrender values, the year's earnings, including the amount available for dividends, will be affected substantially only by the change in the increase in reserves. That being so, we can conclude, with some qualification, that the use of a valuation basis which increases reserves is likely to decrease annual earnings and policy dividends, and the use of a basis which decreases reserves is likely to increase annual earnings and dividends. The increase or decrease in policy dividends resulting from such a change in earnings becomes the factor which directly affects the cost of insurance to policyholders. In the case of non-participating insurance, slight adjustments in premiums might result as complements to the incidence of increases or decreases in reserves.

It can be stated on good authority, and it has been shown by examples in the report of the committee to which I previously referred, that reserves according to modern tables of mortality will not decrease the aggregate reserves of companies. As a matter of fact, the increase in reserves during any year on a normal distribution of business is likely to be larger, but, by such small amounts that the net effect on the cost of insurance, in the aggregate, is likely to be insignificant. We cannot say categorically, therefore, that the use of modern tables in the valuation of life insurance policies will either increase or decrease the cost of insurance.

Much of the misconception as to the effect of changing to modern tables of mortality may be traced to the relative sizes of net premiums according to tables based on later experience when compared to the corresponding net premiums according to the American Experience table. The net premium is a purely theoretical quantity representing the premium which could be charged if a company's death claims were

expected to be in exact accord with the tabular deaths, if the rate of interest assumed in calculating the net premium were the rate sure to be actually earned each year and the business could be operated without expense. There is no doubt that net premiums would be reduced by the use of more modern tables of mortality, and at some ages and on some plans, the reduction would be substantial.

That reserves may be increased, although net premiums for insurance may be decreased, as a result of using tables based on modern mortality experience, is easily susceptible of proof. It should be borne in mind that the reserve on any policy is the difference between the present value of the benefits provided by the policy and the present value of the future net premiums. With a decreased rate of mortality, the present value of the benefits provided by the policy at any time is lower. Under modern tables net premiums are substantially lower, and the present value of the premiums on any policy is also decreased. It will be seen, accordingly, that the reserve represents the difference between two quantities varying in the same direction but in different degrees. The relative differences in the amounts of the decreases determine whether the differences between the quantities increase or decrease. The result of this relationship is that modern tables show reserves on various plans, ages and durations which may differ substantially from those on the American Experience table, either by increase or decrease. In the aggregate, however, and with respect to a normal distribution of business, there is very little change in the reserve. That is the reason that the committee mentioned was able to report that the use of modern tables might well change the incidence of the cost of insurance with respect to various classifications of policies although it might not change the cost very much in aggregates.

Briefly, the effects of the use of modern tables instead of the American Experience table may be summarized as (1) an insignificant change, if any, in the aggregate cost of insurance to policyholders generally, (2) a very slight rearrangement in the non-participating premiums of life insurance companies, and (3) the possibility of a somewhat more extensive rearrangement in the pattern of net costs to policyholders of participating insurance, either by variation in gross premiums, dividends, or both. Because tables based on recent experience are more nearly representative of actual mortality to be expected than those which are now prescribed by statute, it may be inferred that such changes would be in the direction of greater equity to policyholders of life insurance companies. On the basis of these arguments, the recommendation of the special committee mentioned, that legislation permitting the use of more modern tables for valuation purposes

be promoted, was adopted by the National Association of Insurance Commissioners at its meeting early this month.

The laws of the various states are much more liberal in granting discretionary powers in the choice of mortality tables to supervisory officials, companies and their actuaries in the case of annuities than in the case of insurance policies. Almost complete freedom is available, subject to the approval of the insurance commissioners, in the choice of suitable mortality tables in the valuation of annuities. Where legal rigidities exist, they establish bases which, as a result of improved mortality among annuitants, appear to be inadequate to protect the solvency of companies. Observation on what has happened under these liberal requirements constitutes a strong argument for removing some of the rigidities now characteristic of our state valuation laws with respect to insurance.

Fifteen or twenty years ago, it was not unusual for annuities to be issued and valued on the basis of McClintock's annuity tables. This table is based on annuity experience antedating 1900. In the last twenty years, there have been several investigations of annuity mortality by the Actuarial Society of America and by the Institute of Actuaries of Great Britain. These investigations have resulted in definitely demonstrating that annuity mortality has been improving at a very rapid rate, even at those ages where insurance mortality has not been changing very rapidly.

For our purposes there appears to be no necessity for discussing the reasons for such improvement. However, such investigations did result in increasing premium rates for annuities in the case of all companies. As a special matter of interest to us today, however, the improvement in mortality did develop a progressive strengthening of the valuation standards to levels well above the minimum legal requirements. As a matter of fact, the minimum standard in many states might be interpreted as being the same as for insurance, a standard altogether too low for the maintenance of solvency. At the present time, not only do most companies appear to recognize the low yield available on the kind of securities suitable for investment by them by using low interest rates in calculating premiums and in valuation, but they also recognize the improving mortality by forecasting future improvement in the calculation of rates and the maintenance of reserves. Evidence of this is seen in the large number of companies that value annuities on modern annuity tables with an adjustment by which the age has been stepped down from one to two years, and in some cases, three years, to give effect to the probable improvement in mortality in the future.

This progressive strengthening in valuation standards, in connection

with annuities, to meet current mortality and investment developments, has been accomplished without special legislation. This seems to me to be indicative of what would be likely to happen if companies, subject to suitable supervision, were given reasonable latitude in the determination of valuation bases for insurance. I am disposed to think that competition and normal evolution in the business would be the strongest possible forces to induce companies to use modern tables in the valuation of policy reserve liabilities in the same way that they now do in the calculation of premium rates for insurance and annuities and in the valuation of annuities. In addition, the placing of discretionary power in the state insurance commissioners to require changes in reserve standards on appropriate bases should properly safeguard the public interest by making it possible to enforce reasonably uniform action in the direction of adequacy.

That the insurance industry should be faced with the necessity of making explanations to policyholders that they do not base their premiums on, or that the cost of insurance is not controlled by, the mortality tables mentioned in their policies, explanations which are often beyond the ability of their agents to explain satisfactorily, is a handicap which they are entitled to have removed. The use of unnecessary artificialities which result in complications not readily understood to contracting parties in any agreement, and after all, a life insurance policy is an agreement, are undesirable. This situation gives the supervisory authorities a responsibility which they should not ignore. That that responsibility is being assumed by state supervisory officials with respect to the subject of mortality tables is shown by the action of the Commissioners' Association when it adopted recently the report of the committee to which I have previously referred.

My discussion has been very largely confined to one particular in which the mortality table is a financial measuring rod. Obviously, all functions of the mortality table could not be covered properly in a paper of this length. Each of the other functions which I have mentioned offers an interesting field for exploration to those who are interested. There are few complete authoritative works on the use of mortality tables. The available literature is considerably scattered and many matters regarded as fundamental have become traditional in actuarial practices without detailed exposition in generally available literature. The journals of the various actuarial bodies on this continent and in Great Britain, from which many of our actuarial traditions have emanated, are the authoritative sources on this subject. References to other sources will be found therein to the subject of mortality tables, a subject historically interesting and scientifically unexhausted.

STANDARD CLASSIFICATION OF INDUSTRIES IN THE UNITED STATES

By Vladimir S. Kolesnikoff
Executive Office of the President

The purpose of this article is to describe as briefly as possible the interagency project on the development of a uniform classification of industries in the United States, which project is sponsored by the Central Statistical Board (now part of the Budget Bureau, Executive Office of the President).

The necessity for a standard industrial classification for the presentation of statistics collected by the Federal Government has long been a matter of concern to statisticians.

Heretofore, various agencies collecting reports have used their own industrial classifications so that a given establishment may be classified in one industry by one agency and in another industry by another agency. In addition, the grouping of industries may be different. The examples of such differences are too numerous to be reported in detail. A few illustrations will suffice.

The quite sizable industry, "confectionery," in reports of some agencies means "confectionery including ice cream" (about 82,000 employees with value of products about $470,000,000) and in reports of other agencies confectionery manufacturing means "confectionery not including ice cream" (about 58,000 employees with value of products about $260,000,000).

In the same manner, manufactured ice is classified as a part of the food industries, but some other offices consider this industry as a part of miscellaneous manufacturing industries.

Restaurants and gasoline filling stations for a long time could not be placed and have been reported sometimes in retail trade, sometimes as a part of service industries.

During the past three years several committees of experts have been working on different phases of manufacturing and nonmanufacturing industries under the general supervision of the Central Statistical Board Committee on Industrial Classification. The Committee has organized a Technical Committee (1) to coordinate the work of the various committees responsible for classification of the various phases of industrial activity; (2) to obtain from Federal and State governmental agencies, trade associations and private research organizations suggestions and criticisms on the tentative drafts of the classification; (3) to prepare the alphabetic index of establishments, products and

services included in the manufacturing and nonmanufacturing industries; (4) to submit a final report for the Committee; and (5) to continue to direct the work of considering from time to time whatever changes may be recommended by the agencies interested.

The following Government agencies and persons are actively participating in the development of this project:

Agency	*Main Committee*	*Subcommittees**
Executive Office of the President	Morris A. Copeland, Chairman Vladimir S. Kolesnikoff	Morris A. Copeland (T) Edward B. Hincks (D) Vladimir S. Kolesnikoff (T,E,M,S,C,D) Esther Pearce (T,M) Peter M. Rouzitsky (W, R)
Treasury Department	Roy Blough	Helen F. Demond (M, C) Louis Shere (C)
Department of Agriculture		Ralph L. Dewey (U)
Department of Commerce	Nathanael H. Engle Vergil D. Reed (Howard H. McClure, aternate)	John Albright (W) Fred A. Gosnell (T) Harold D. Kube (M,D) Herman Lasken (S) Howard H. McClure (C) Robert Nathan (S) William A. Ruff (R) Harold Stehman (W) M. Lowell McElroy (R)
Department of Labor	Isador Lubin (Aryness Joy, alternate)	Emanuel E. Horstman (W,R) M. D. Kossoris (T,E) Louis E. Talbert (W,R) Loring Wood (M)
Federal Security Agency	Ewan W. Clague (Merrill G. Murray, alternate)	John Arnold (C) William H. Cummins (T,M,S,D) Bruno Fels (M,D) Frank J. Nagle (M,D) Samuel Schloss (D) Tillman M. Sogge (T,E, M,S,D) George Webber (M,S)

* Letters after names indicate membership in Technical Committee and Subcommittees as follows: T—Technical Committee; E—Steering Group of the Technical Committee; M—Manufacturing; W—Wholesale; R—Retail; F—Finance; S—Service industries; U—Transportation and other public utilities; D—Description of industries; C—Corporation classification.

Agency	*Main Committee*	*Subcommittees*
Federal Reserve System		Maxwell R. Conklin (W, R)
Securities and Exchange Commission	R. W. Goldsmith	E. A. Bolster (F,C) R. C. Parmelee (F,C)
Federal Deposit Insurance Corporation		Clark Warburton (F)
U. S. Tariff Commission	E. Dana Durand	Louis S. Ballif (T)
Interstate Commerce Commission		T. Hultgren (U)
Department of Labor of New York	Meredith B. Givens	Leonard P. Adams (T, M)

In addition to the present members listed above, Solomon Kuznets, Department of Labor, New York, and James Buckley, Securities and Exchange Commission, have participated in the preparation of the first drafts of the classification.

Important contributions to the classification work in addition to the work in committees were made by Vergil D. Reed, Assistant Director of the Census Bureau, who introduced the United States Standard Industrial Classification to the International Congress on Distribution held in Copenhagen; Howard H. McClure, Assistant Chief Statistician for Manufactures, Bureau of the Census, who by special arrangement between the Central Statistical Board and the Bureau of the Census conducted conferences with representatives of trade associations in order to obtain their comments and criticisms on the tentative drafts; Ewan W. Clague, Director of the Bureau of Research and Statistics, Federal Security Agency, who assigned members of his research, editorial and clerical staff to work on the project; and William H. Cummins, Bureau of Old-Age and Survivors Insurance, Federal Security Agency, who prepared a classified tabulation of 250,000 establishments in nonmanufacturing industries.

In the preparation of this classification, the constructive criticisms and suggestions received from Federal agencies, State unemployment compensation agencies, trade associations, special research organizations and business executives have proved invaluable.

The complete project includes (1) list of industries (2) description of industries and (3) alphabetic index of products, establishments and services with cross references to industries. For practical purposes all work is subdivided into two volumes: (1) manufacturing industries and (2) nonmanufacturing industries.

There are 1,411 industries in the Standard Classification, listed as 4-digit items and put in 524 closely related industrial groups, listed as 3-digit items. Groups, in turn, are combined in 96 major groups identified as 2-digit items. All major groups comprise eight principal divisions, identified by letters.

The following summary gives a list of 96 major groups and the numbef of 2-digit, 3-digit and 4-digit items in each principal division.

SUMMARY OF THE STANDARD CLASSIFICATION OF INDUSTRIES IN THE UNITED STATES

	Major Groups	Number of items in classification		
		2-digit	3-digit	4-digit
	Total for all industries	96	524	1411
	DIVISION A. AGRICULTURAL, FORESTRY, AND FISHERY INDUSTRIES	10	39	43
00	General farms	1	1	1
01	Dairy farms	1	1	1
02	Cash grain farms	1	1	1
03	Cotton farms	1	1	1
04	Fruit and nut farms	1	7	7
05	Livestock and poultry farms	1	7	7
06	Truck farms, crop specialties, and miscellaneous agriculture	1	9	10
07	Agricultural and similar service establishments	1	4	7
08	Forestry	1	6	6
09	Fishery	1	2	2
	DIVISION B. MINING	5	23	54
10	Metal mining	1	7	18
11	Anthracite mining	1	1	5
12	Bituminous and other soft-coal mining	1	3	5
13	Crude petroleum and natural gas production	1	3	5
14	Nonmetallic mining and quarrying	1	9	21
	DIVISION C. CONSTRUCTION	2	15	24
16	Construction—general contractors	1	6	6
17	Construction—special trade contractors (subcontractors)	1	9	18
	DIVISION D. MANUFACTURING	20	145	504
20	Food and kindred products	1	9	44
21	Tobacco manufactures	1	3	3
22	Textile-mill products	1	9	45
23	Apparel and other finished products made from fabrics and similar materials	1	9	48
24	Lumber and timber basic products	1	3	8
25	Furniture and finished lumber products	1	8	27
26	Paper and allied products	1	8	26
27	Printing, publishing, and allied industries	1	9	21
28	Chemicals and allied products	1	9	37
29	Products of petroleum, coal, and natural gas	1	4	7
30	Rubber products	1	6	12
31	Leather and leather products	1	8	17
32	Stone, clay, and glass products	1	9	38
33	Iron and steel and their products	1	9	43

SUMMARY OF THE STANDARD CLASSIFICATION OF INDUSTRIES IN THE UNITED STATES—*Continued*

	Major Groups	Number of items in classification		
		2-digit	3-digit	4-digit
	DIVISION D. MANUFACTURING—*Continued*			
34	Transportation equipment (except automobiles)	1	5	8
35	Nonferrous metals and their products	1	9	35
36	Electrical machinery	1	7	7
37	Machinery (except electrical)	1	8	37
38	Automobiles and automobile equipment	1	4	5
39	Miscellaneous manufacturing industries	1	9	36
	DIVISION E. WHOLESALE AND RETAIL TRADE	22	122	417
40	Wholesale trade—service and limited-function wholesalers (including exporters and importers)	2	19	103
42	Wholesale trade—manufacturers' sales branches and offices	2	17	80
44	Wholesale trade—petroleum bulk tank stations	1	1	1
45	Wholesale trade—agents and brokers	2	19	103
47	Wholesale trade—assemblers of farm products	1	4	19
48	Chain-store warehouses	1	7	7
49	Retail trade—food	1	6	15
50	Retail trade—general merchandise	1	6	8
51	Retail trade—apparel and accessories	1	8	21
52	Retail trade—furniture, home furnishings and equipment group	1	3	11
53	Retail trade—automotive group	1	4	5
54	Retail trade—filling stations	1	1	2
55	Retail trade—drug stores	1	1	2
56	Retail trade—eating and drinking places	1	3	3
57	Retail trade—hardware	1	2	2
58	Retail trade—lumber and building	1	5	5
59	Retail trade—liquor	1	2	2
60	Retail trade—second-hand stores	1	5	5
61	Retail trade—not elsewhere classified	1	9	23
	DIVISION F. FINANCE, INSURANCE, AND REAL ESTATE	10	60	185
62	Banking	1	7	27
63	Credit agencies other than banks—long term	1	8	28
64	Credit agencies other than banks—short term	1	5	26
65	Investment trusts and investment companies	1	7	8
66	Holding companies or investment-holding companies	1	6	11
67	Security and commodity brokers, dealers and exchanges	1	7	19
68	Finance not elsewhere classified	1	3	3
69	Insurance carriers	1	6	32
70	Insurance agents, brokers and service	1	4	7
71	Real estate	1	7	24
	DIVISION G. TRANSPORTATION, COMMUNICATION, AND OTHER PUBLIC UTILITIES	12	47	72
72	Railroads	1	4	4
73	Street, suburban, and interurban railways (including companies operating bus lines in conjunction with street railways)	1	4	4
74	Highway passenger transportation	1	5	5
75	Highway freight transportation	1	3	4

SUMMARY OF THE STANDARD CLASSIFICIATION OF INDUSTRIES IN THE UNITED STATES—*Continued*

	Major Groups	Number of items in classification		
		2-digit	3-digit	4-digit
	DIVISION G. TRANSPORTATION—*Continued*			
76	Water transportation	1	6	23
77	Air transportation	1	3	3
78	Pipe line transportation	1	2	2
79	Warehousing and storage	1	5	6
80	Services incidental to transportation	1	6	9
81	Communication	1	4	4
82	Heat, light and power	1	3	6
83	Water and sanitary services	1	2	2
	DIVISION H. SERVICES	15	73	112
84	Hotels, rooming houses, camps, and other lodging places	1	4	7
85	Personal services	1	8	16
86	Domestic service	1	1	1
87	Business services not elsewhere classified	1	7	12
88	Automobile repair services and garages	1	7	11
89	Miscellaneous repair services and hand trades	1	6	10
90	Motion pictures	1	3	4
91	Amusement, recreation, and related services (other than motion pictures)	1	7	13
92	Medical and other health services	1	9	11
93	Legal services	1	1	1
94	Engineering and other professional services, not elsewhere classified	1	3	3
95	Educational services	1	7	13
96	Non-profit membership, charitable and religious organizations	1	8	8
97	Government	1	1	1
99	Non-classifiable establishments	1	1	1

Because of the varying degrees of detail in classification which may be needed by different agencies the list of classified industries has been constructed so that either a two-digit, three-digit, or four-digit classification may be used. The classification system also makes it possible for several industries to be combined into one industry, or several industrial groups to be combined into one group provided that no cross is permitted and comparability with the standard classification is maintained.

Limited space makes it impossible to give a complete list of 524 industry groups and 1411 industries. Just to illustrate how the standard classification is constructed, how three classifications of varying degrees of detail are given in one listing, the classification of manufacturing industries in major group 35 is shown on the next page.

If one wants to use a two-digit classification he should read only the first column where the name of the major group is given.

If it is desirable to use a three-digit classification, one should read all items in the second column where industry groups are given.

If one wants to use a four-digit classification, he should read all items in the third column where industries are listed.

LIST OF MANUFACTURING INDUSTRIES IN MAJOR GROUP 35, NONFERROUS METALS

(*2-digit classification:* 35 Nonferrous metals and their products)

3-digit classification	*4-digit classification*
351 Primary smelting and refining of nonferrous metals	3511 Copper
	3512 Lead
	3513 Zinc
	3514 Gold
	3515 Silver
	3516 Aluminum
	3519 Primary smelting and refining of nonferrous metals not elsewhere classified
352 Secondary smelting and refining of nonferrous metals and alloys	3521 Copper, brass, and bronze
	3522 Lead and lead alloys
	3523 Zinc
	3524 Aluminum and aluminum alloys
	3525 Gold, silver, and platinum
	3529 Secondary smelting and refining of nonferrous metals not elsewhere classified
353 Primary alloying, and rolling and drawing of nonferrous metals (except aluminum)	3531 Copper, brass, and bronze primary alloying, and rolling and drawing
	3539 Primary alloying, and rolling and drawing of nonferrous metals and alloys not elsewhere classified
354 Clocks and watches	3541 Clocks, watches, and materials and parts (except watchcases)
	3542 Watchcases
	3543 Assembling of watches and clocks
355 Jewelry	3551 Jewelry (except costume jewelry)
	3552 Jewelers' findings and materials
	3553 Lapidary work
356 Silverware and plated ware	3561 Silverware and plated ware
357 Engraving, plating, and polishing (metal)	3571 Engraving on metal (except for printing purposes)
	3572 Electroplating, plating, and polishing
358 Lighting fixtures	3581 Electric-light fixtures
	3589 Lighting fixtures (except electric)
359 Nonferrous metal products not elsewhere classified	3591 Nonferrous metal foundries (except aluminum)
	3592 Aluminum products (including rolling and drawing)
	3593 Nonferrous metalware (except foundry products and aluminum ware)
	3594 Metal novelties and specialties (except foundry products)
	3595 Collapsible tubes
	3596 Gold leaf and foil
	3597 Tin and other foils (except gold foil)
	3598 Sheet-metal work not specifically classified
	3599 Nonferrous metal products not elsewhere classified

The classification of industries in the remaining 95 major groups is constructed in the same manner as the classification for major group 35 given here as an illustration.

It should be added that for Division E, Wholesale and Retail Trade, a more detailed classification by kind of business and type of operation is given in a supplementary code carried to the fifth and sixth digits.

The classification is intended for use with data supplied by the establishments to be classified. The determination of the fourth digit, and in some instances the third digit, will require data from detailed questionnaires or correspondence with the concerns or establishments to which these digits might apply.

After the titles of industries had been established, the committees proceeded to prepare descriptions of industries and an index of products and services. The job of developing descriptions for 1411 industries and the work of selecting some 12,000 items for the index proved to be very long and extremely difficult, sometimes heart breaking. Nonetheless this work was indispensable for the very simple reason that the industry title never tells the complete story as to what a given industry is doing and what is the scope of the industry.

At the beginning of this article it was said that one of the functions of the Technical Committee on Industrial Classification is to continue to direct the work of considering from time to time whatever changes may be recommended by the agencies interested. According to this, August first of every year was established as a closing date to receive such recommendations. So it appears that August 1, 1940 will be first such closing date for filing all suggestions, requests and recommendations for changes to be made. The first printed edition of the standard classification revised on the basis of recommendations and comments received will be published in December 1940.

The writer notes with great pleasure that for the Sixteenth Decennial Census of Population, Agriculture, Manufactures, Mines, and Distribution, the Census Bureau is going to use industrial classifications comparable to the standard classification; that the Federal Security Agency uses a classification of manufacturing industries identical to the standard and a classification of nonmanufacturing industries comparable to the standard; that the Treasury Department uses the standard classification of enterprises for the tabulation of 1938 income tax statistics; and that the Securities and Exchange Commission, the Bureau of Labor Statistics, and other agencies participating in the work of constructing the standard classification of industries will use this classification.

It is important to add that the new classification of industries for uniform presentation of statistics collected has been developed on the principle that the classification should conform to the existing structure of American industry. It should not be confused with natural or objective classification which may be constructed for analytical purposes.

AN INDUSTRIAL CLASSIFICATION FOR REPORTS FROM INDIVIDUALS

By Bruno Fels, *Social Security Board*, and
P. K. Whelpton, *Central Statistical Board*

In a recent article in this Journal, Dr. Gladys L. Palmer discussed the preparation and content of the Convertibility List of Occupations.[1] Among other things, she pointed out that the Committee on Occupational Classification found it impossible to obtain an adequate grouping of workers from an occupational standpoint without subdividing by industry the occupational titles of "Proprietors, managers, and officials, n.e.c.," "Foremen, n.e.c.," "Inspectors, n.e.c.," "Operatives and kindred workers, n.e.c.," and "Laborers, n.e.c." Some of the problems arising in connection with the determination of these subdivisions showed clearly the need of a thorough examination of an industrial classification system from the point of view of its use in connection with information secured under conditions like those of a house-to-house canvass. Such industry returns are used commonly to classify workers, and occasionally to classify their dependents as well. If the goal is to show the industrial distribution of such items as pay rolls, gross income, or value added by manufacture or by services rendered, the information is almost invariably obtained from employing units, in which case problems of an entirely different kind are encountered. It is the result of the Committee's study of an industrial classification of workers which is presented here.[2]

In considering the specific industrial groups into which the above-mentioned occupations should be subdivided, the starting point was the Standard Industrial Classification, described elsewhere in this Journal by Vladimir S. Kolesnikoff.[3] Two reasons for this are obvious —the Standard Industrial Classification provides a carefully thought-out system covering the entire realm of industry, and is being adopted generally by agencies gathering industrial statistics. In fact, its advantages are so great that deviations from its various levels of principal divisions, major groups, industry groups and industries may be anticipated rarely, unless made necessary by shortcomings in the in-

[1] Palmer, Gladys L.: "The Convertibility List of Occupations and the Problems of Developing It." This Journal, 34 (1939), 693–708.

[2] Much of the material in this article is taken from reports of the Committee on Occupational Classification, and its Technical Subcommittee. These Committees were established jointly by the American Statistical Association and Central Statistical Board. Their membership is shown in the article by Miss Palmer cited in Footnote 1.

[3] Kolesnikoff, Vladimir S.: "A Standard Classification of Industries in the United States." See pp. 65–73.

formation available on the schedules. Unfortunately, deficiencies in the reports on the industry of workers obtained in a household enumeration appear to make deviations unavoidable.

The Standard Industrial Classification was devised primarily for use in connection with returns from employers, and assumes the availability of accurate and fairly detailed information regarding the business carried on by their establishments. For example, in its major-group titles distinctions are made between "Construction—general contractors" and "Construction—special trade contractors," between "Credit agencies (long term) other than banks" and "Credit agencies (short term) other than banks," and in its industry-group titles between "Interurban railways operating bus lines" and "Interurban railways not operating bus lines." Most proprietors and executives can tell quite easily in which category their concern belongs, though difficulties arise with concerns operating in several industries. The rank and file of employees, too, may know enough about the business carried on where they work so that if they are questioned by trained interviewers their replies may be sufficiently complete to permit classifying them according to the 524 industry-group titles of the Standard Industrial Classification. The industrial information obtained in the placement interviews of the various State employment service offices illustrates this situation. In a household type of enumeration, however, the interviewers frequently are not highly trained and —more important— they are less likely to see the workers themselves than to see some other members of the households. The latter usually are not sufficiently well informed about the industry of the workers' employers to permit the use of the majority of the 3-digit industry-group titles and even of some of the 2-digit major-group titles of the Standard Industrial Classification.[4] The eight principal divisions of the system can be utilized, of course, but a finer classification is usually of much greater value.

After considering various aspects of the problem, the Committee on Occupational Classification concluded that the best procedure would be to combine those 2-digit major-group and 3-digit industry-group titles which could not be identified fairly easily and accurately from reports obtainable from members of workers' families. In addition, it seemed desirable not to show separately industry groups which have a comparatively small number of workers, though perhaps large by

[4] The Standard Industrial Classification is composed of 8 "divisions" designated by letters, 96 "major-groups" designated by 2-digit code numbers, 524 "industry-groups" designated by 3-digit code numbers, and 1411 "industries" designated by 4-digit code numbers. See Vladimir S. Kolesnikoff, *op. cit.*

other standards, unless they are of outstanding interest from some standpoint such as the potential growth of the industry or the peculiar characteristics of the persons engaged. In order to maintain comparability with the Standard Industrial Classification the combinations were restricted (with seven exceptions) to 2-digit major-group titles under a given principal division of the Standard and to 3-digit industry-group titles under a given 2-digit major-group. Five of the seven exceptions were made in cases where it was believed that information obtainable from workers' families usually would not be sufficiently specific to distinguish between the titles grouped, even though they are subdivisions of different major-group titles in the Standard. In such cases it was believed preferable to deviate from the Standard (especially since the industries involved do not employ large numbers of workers) than to establish on paper a classification which usually could not be followed in practice.

The *Industrial Classification for Reports from Individuals*, prepared in accordance with the above concepts, is presented herewith. It contains 132 titles, of which 70 are taken directly from the Standard Industrial Classification, 52 are combinations of titles in that list, and 4 are new subdivisions of the title "Government." The remaining 6 titles, namely "Not specified mining," "Not specified textile mills," "Not specified metal industries," "Not specified manufacturing industries," "Not specified retail trade," and "Nonclassifiable," are included to provide for the incomplete returns which occur under procedures like those of a population census enumeration. This system requires 3-digit code numbers, or 2-digit code symbols utilizing the "x" and "v" positions on the punch card. The latter are being used by the Bureau of the Census, and will appear in their topical and alphabetical indexes for use in coding, which will be published in May 1940. For agencies which desire 2-digit code numbers without utilizing the "x" and "v" positions on the punch card, certain titles of the 132-item list have been combined to form a shorter list of 99 items.[5] The shorter list omits the five "Not specified" titles, but retains the "Nonclassifiable" title. It is suggested that agencies needing greater detail than 132 items use subdivisions from the Standard Industrial Classification The content of any title in either the 132-item or the 99-item list is the content of the corresponding title or titles in the Standard Industrial Classification. It can be determined by referring to the alphabetic indexes prepared for use in connection with that classification,[6]

[5] Copies of the 99-item list may be obtained from the Secretary of the Committee on Occupational Classification, Central Statistical Board, Bureau of the Budget, Washington, D. C.

or to the topical and alphabetical indexes being prepared by the Bureau of the Census.

As was mentioned above, four titles in the accompanying list ("Postal service," "National defense," "Federal Government n.e.c.,"[7] and "State and local government") are new subdivisions of the major-group "Government" in the Standard Industrial Classification. The Committee on Industrial Classification plans to develop this major-group more completely at a later date, but has approved the use of these four subdivisions in connection with the 1940 Census of Population. "Postal service" and "National defense" are activities carried on exclusively by the Government, hence both the central administrative units and the detached operating units in these fields are included under these headings. "Federal Government n.e.c.," and "State and local government" include (a) activities characteristically performed by the various branches of Federal, State or local government as above, but (b) only the central administrative units of those governmental agencies engaged in activities which are sometimes performed by governmental and sometimes by private entities; for example, education and health services, electric power service, shipbuilding, transportation services, liquor retailing, and forest management. The actual operating units of such agencies and the offices of these operating units (schools, hospitals, power plants, shipyards, subway lines, liquor stores, national forests, etc.) should be included under the appropriate industry titles of the non-governmental divisions. In industries where both Government and private workers are important, it is recommended that a distinction be made between them, using a supplementary code symbol or other device.

Whether workers on CCC, NYA, WPA and other Federal, State or local work relief projects should be distributed among the subdivisions of "Government" or classified like persons in private employment, i.e., according to the industry to which they are attached, was considered carefully by the Committee on Occupational Classification. From the standpoint of most uses of the material, the advantages were found to be principally with the latter. The Committee recommended that in the case of industries in which there are many relief project workers (such as construction, forestry, apparel manufacture, educational and

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[6] *Standard Industrial Classification:* Vol. I, Part 4, *Alphabetic Index of Products, Establishments and Processes;* and Vol. II, Part 4, *Alphabetic Index of Products, Establishments and Services.* Copies of the 132- and the 99-item lists, showing the content of each title in terms of the code symbols of the Standard Industrial Classification, may be obtained from the Secretary of the Committee on Occupational Classification. (See Footnote 5.)

[7] "N.e.c." is an abbreviation of "not elsewhere classified."

research services, and Government), the relief workers be shown separately from the workers on private or regular Government pay rolls. In some studies it may be desirable to go a step farther and group workers first on the basis of relief and non-relief and then subdivide each group by industry, instead of grouping first by industry and subdividing the workers in certain industries only into relief and non-relief groups.

How to classify industrially persons with no previous work experience, was another problem considered. In most cases it was believed preferable that no industrial affiliation be shown for them. However, if such persons are to be classified by the industry for which they are trained, or in which they are seeking work, it was recommended that the data for them be shown separately from those for persons with previous work experience.

THE UNIT OF CLASSIFICATION

Determining the unit of industry to be used in a classification system is a problem which arises in dealing with returns from workers' families as well as from establishments. In the latter case a variety of units has been used—corporation, organization, enterprise, establishment, tax-paying unit, or any part of these as determined by county or State boundaries—the choice apparently depending largely on the purpose for which the classification is made. After considering carefully the limitations of industrial information obtainable from a house-to-house canvass, the Committee on Occupational Classification recommended that the unit be the establishment—the "immediate place of work." The definition of establishment suggested by the Committee is "each place of work, usually though not always under one roof, where an employer employs others, or where a person works on his own account either alone or with the help of unpaid members of his family." This is an elaboration of the definition of the Committee of Statistical Experts of the League of Nations that an establishment is "the place at which the work is performed."[8] From the standpoints of practicability of application and of interpretation of results the establishment as defined above has come to be considered a more satisfactory unit for classifying household reports by industry than units based on "the technique of the work," or "the legal and financial organization of the enterprise."[9]

An establishment as defined above is identical in most cases with

[8] League of Nations. Committee of Statistical Experts: *Report to the Council on the Work of the Sixth Session*. Official No.: C.217.M.158. 1937. II A. (C.E.S.94). pp. 7.

[9] *Ibid.*

what in everyday language is termed a factory, store or other "established" place of business. In addition, it includes places of work without a roof, such as street corner newspaper stands, parking lots and roads under construction. Certain types of workers, such as peddlers, itinerant vendors, canvassers and solicitors, do not even have what is generally understood to be an "established" place of work. To cover cases such as these in the wording of a definition would burden it with exceptions and exceptions to the exceptions. The Committee of Statistical Experts of the League of Nations has advised against such an attempt, experience having shown that a short formula will meet most practical purposes. In most cases where it fails to give a complete answer, common sense together with an understanding of the goal to be obtained has proved to be of more help than elaborate definitions.

Classifying workers industrially by "immediate place of work" rather than by "technique of the work" affects the resulting data greatly in many cases. For example, lithographers are shown under several industries (since they are employed in tin can factories, card board box factories, job printing plants, etc.) instead of all being included under "printing, publishing, and allied industries." Similarly but on a broader scale, telephone operators are shown over practically the whole range of industry instead of being lumped together under "communication." Since persons in each of these occupations are grouped together in an occupational classification, it is undesirable to follow the concept "technique of the work" in an industrial classification and group them together here also. The outstanding advantage of emphasizing "immediate place of work" in an industrial classification is that it provides a distribution of workers by the branch of the economic system to which they are attached, leaving to an occupational classification the task of providing a distribution by the kind of work which they do. It is the belief of the Committee that this differentiation, operating through the use of separate codes for occupation and industry, will make it possible to meet many more of the various demands for both the occupational and industrial statistics which are obtainable from reports of individuals than has been possible in the past.

"Immediate place of work" rather than "immediate place of employment" was recommended by the Committee partly because it is more inclusive, covering owner-operated places where no persons work for wages or salary. Of greater importance is the fact that it emphasizes as "industry" the activity performed at a specific establishment or place of work rather than at a main plant or at a central administrative office from which an organization as a whole is directed. For most pur-

poses the results of an industrial classification of workers are more realistic and significant if miners working at a coal mine or an iron ore mine owned and operated by a steel concern are shown under "coal mining" or "metal mining" respectively, instead of under "steel works." In such cases the classification should not be affected by physical location, i.e., whether the different branches of activity are located at one site or at widely separated sites. Stated generally, the "immediate place of work" concept has the advantage of distributing the employees of a concern engaged in successive (vertical) stages of production, transportation, or distribution among the industries represented by the various units of the concern, rather than lumping them all in one industry—usually the one by which the concern is generally known to the public.

In an analogous way, the Committee believes that places of work with activities which have an accessory relationship to a firm's predominant activity should be reported and classified by industry without reference to legal, financial, or administrative bonds. For example, a nurse in a hospital or a counterman in a cafeteria operated by a steel concern should be shown under "medical and other health services" and "eating and drinking places" respectively rather than under "steel works." Places of work with activities of such types should be considered as separate "establishments" even though they are "under the same roof" as the places of work to which they are accessory.

In contrast to the vertical and accessory relationships discussed above are those of an auxiliary character. Workers in specialized departments of a concern may properly be reported differently as to "immediate place of work," but the kind of work performed in these places may be so intimately connected with the activities in the "sustaining" unit that the workers should be classified in the industry of the latter according to the Committee. For example, the pattern shop and foundry of a tractor factory are intregal parts of the factory, hence their workers should be classified industrially under "agricultural machinery and tractors." Similarly the garage and warehouse operated by a department store are service divisions of the latter, hence the workers in them should be classified industrially under "general merchandise stores." For analogous reasons workers in the power plant of a steel works should be classified industrially under "steel works," workers in the painting and upholstering shops of an automobile factory under "automobiles," and workers in a ticket agency and repair shop of a railroad under "railroads."

Drawing the line between auxiliary and accessory (or vertical) relationships is admitted to be difficult in some cases and to require some

arbitrary decisions. Here again elaborate definitions could be set up, but it appears preferable to use as guides the closeness of the connection between the departments in question and the main process of production, trade or service, and the frequency with which technical or economic considerations make it more attractive, if not compulsory, for an enterprise to own and operate the departments in question rather than to have their services secured on a contract basis from outside, independent establishments.

It is recognized by the Committee that the successful application of concepts like these is limited by the information obtained on the schedules. If a man is returned as "engineer, steel company," he can be classified industrially only under "steel works" and not under "metal mining," though actually he may work in an iron ore mine operated by the company. Similarly, if the industry reported is merely "repair shop" the worker can be classified only under that industry, and not under the industries "railroad," "Government," or "general merchandise store," with which the repair shop may be connected. In such cases it is often very helpful to have the employer's name and address entered on the schedule, especially if a directory of firms and their activities is available.

Another type of problem arises when an employee works at an establishment not operated by his immediate employer. For example, should a demonstration girl be classified according to the cosmetic products manufacturer ("miscellaneous chemical industries") on whose pay roll she appears or to the "five and ten" ("limited price variety stores") where she is working? Similarly, should a member of a conductor's band be classified under "Hotels and lodging places" because playing at a hotel lounge, or under "Miscellaneous amusement and recreation" because on the pay roll of the conductor? On the whole, it seemed preferable to the Committee to emphasize the employer-employee relationship and to classify such cases by the industry of the employer rather than by the industry of the immediate place of work. This may be the only possible way of dealing with information from employers' reports, since they are not likely to indicate precisely where the individual employees are at work, nor the "industry" of the "immediate place of work." The Committee recognized, however, that when the basic information is gathered by a house-to-house canvass and when the industry usually wanted is that of the "immediate place of work," the enumerators will fail to ascertain the industry of the employer in many of the cases for which it is needed. Limitations of the data, therefore, may make it impracticable to classify such workers on any other basis than the immediate place of work.

One of the serious obstacles faced in the past by persons utilizing statistics of workers by industry has been the lack of comparability due to the differences in the classification systems followed by the agencies gathering these data. If most such agencies can agree on a single system, the usefulness of their material will be increased greatly. In view of the careful consideration given to many problems in preparing the *Industrial Classification for Reports from Individuals*, and in view of its adoption by the important agencies which participated in its preparation, the probability is that it will come into general use in the type of studies for which it is designed. The comparability of industrial statistics of workers will then be much greater than at present, and the differences which still exist will be due chiefly to variations in the information possessed by the respondents and in the thoroughness with which they are questioned. The importance of these last two factors should not be minimized, however. Differences of some significance would be expected between two classifications of 1000 workers, one based on the industrial information obtainable through population census enumerators, and another based on that obtainable through intensive employment office interviews. Differences of greater significance would be expected between the former and a classification of the same workers based on reports from their employers. No doubt it will be more difficult to harmonize returns from different sources than to bring about the general use of one classification system. But now that the latter is about to be accomplished by the concerted action of governmental and private agencies, it may be that effort can be concentrated on improving the quality of the original returns.

INDUSTRIAL CLASSIFICATION FOR REPORTS FROM INDIVIDUALS[1]

A. Agriculture, Forestry, and Fishery

Agriculture
Forestry (except logging)
Fishery

B. Mining

Coal mining[2]
Metal mining
Mining (continued)
Crude petroleum and natural gas production[3]
Sand and gravel production
Stone quarrying
Miscellaneous nonmetallic mining
Not specified mining

[1] This list contains 132 titles. Copies of the condensed list prepared by the Committee, containing 99 titles, may be obtained from the Secretary of the Committee on Occupational Classification, Central Statistical Board, Bureau of the Budget, Washington, D. C.

[2] If the industrial information being classified includes data for anthracite coal mining in Pennsylvania, it is recommended that this industry be distinguished from bituminous and other soft coal mining on the basis of geographical location.

[3] Includes natural gasoline production.

INDUSTRIAL CLASSIFICATION FOR REPORTS FROM INDIVIDUALS—*Continued*

C. Construction

Construction

D. Manufacturing

FOOD AND KINDRED PRODUCTS
- Bakery products
- Beverage industries
- Canning and preserving fruits, vegetables, and sea-food
- Confectionery
- Dairy products
- Grain-mill products
- Meat products
- Miscellaneous food industries

TOBACCO MANUFACTURES
- Tobacco manufactures

TEXTILE-MILL PRODUCTS
- Cotton manufactures
- Silk and rayon manufactures
- Woolen and worsted manufactures
- Knit goods
- Dyeing and finishing textiles
- Carpets, rugs, and other floor coverings
- Hats (except cloth and millinery)
- Miscellaneous textile goods
- Not specified textile mills

APPAREL, AND OTHER FABRICATED TEXTILE PRODUCTS
- Apparel and accessories
- Miscellaneous fabricated textile products

LUMBER, FURNITURE, AND LUMBER PRODUCTS
- Logging
- Sawmills and planing mills
- Furniture and store fixtures
- Miscellaneous wooden goods

PAPER AND ALLIED PRODUCTS
- Pulp, paper, and paperboard mills
- Paperboard containers and boxes
- Miscellaneous paper and pulp products

Manufacturing (continued)

PRINTING, PUBLISHING, AND ALLIED INDUSTRIES
- Printing, publishing, and allied industries

CHEMICALS AND ALLIED PRODUCTS
- Paints, varnishes, and colors
- Rayon and allied products
- Miscellaneous chemical industries

PETROLEUM AND COAL PRODUCTS
- Petroleum refining
- Miscellaneous petroleum and coal products

RUBBER PRODUCTS
- Rubber products

LEATHER AND LEATHER PRODUCTS
- Leather: tanned, curried, and finished
- Footwear industries (except rubber)
- Leather products (except footwear)

STONE, CLAY, AND GLASS PRODUCTS
- Cement, and concrete, gypsum, and plaster products
- Cut-stone and stone products
- Glass and glass products
- Pottery and related products
- Structural clay products
- Miscellaneous nonmetallic mineral products

IRON AND STEEL AND THEIR PRODUCTS
- Blast furnaces, steel works, and rolling mills
- Tin cans and other tinware
- Miscellaneous iron and steel industries

NONFERROUS METALS AND THEIR PRODUCTS
- Nonferrous metal primary products
- Clocks, watches, jewelry, and silverware[4]
- Miscellaneous nonferrous metal products

[4] Includes metal engraving (except for printing purposes), plating and polishing.

INDUSTRIAL CLASSIFICATION FOR REPORTS FROM INDIVIDUALS—*Continued*

Manufacturing (continued)

MACHINERY
- Agricultural machinery and tractors
- Electrical machinery and equipment
- Office and store machines, equipment, and supplies

Miscellaneous machinery

TRANSPORTATION EQUIPMENT
- Aircraft and parts
- Automobiles and automobile equipment
- Ship and boat building and repairing
- Railroad and miscellaneous transportation equipment

NOT SPECIFIED METAL INDUSTRIES
- Not specified metal industries

MISCELLANEOUS MANUFACTURING INDUSTRIES
- Scientific and photographic equipment and supplies
- Miscellaneous manufacturing industries, n.e.c.

NOT SPECIFIED MANUFACTURING INDUSTRIES
- Not specified manufacturing industries

E. Transportation, Communication, and Other Utilities

TRANSPORTATION
- Air transportation
- Petroleum and gasoline pipe lines
- Railroads (includes R. R. repair shops)
- Railway express service
- Street railways and bus lines[5]
- Taxicab service
- Trucking service
- Water transportation
- Warehousing and storage
- Services incidental to transportation
- Not specified transportation

Transportation (continued)

COMMUNICATION
- Telephone (wire and radio)
- Telegraph (wire and radio)
- Radio broadcasting and television

UTILITIES
- Electric light and power
- Gas works and steam plants
- Water and sanitary services

F. Wholesale and Retail Trade

WHOLESALE TRADE
- Wholesale trade

RETAIL TRADE
- Food stores, except dairy products
- Dairy products stores and milk retailing
- General merchandise stores
- Limited price variety stores
- Apparel and accessories stores, except shoes
- Shoe stores
- Furniture and housefurnishings stores
- Household appliance and radio stores
- Motor vehicles and accessories retailing
- Filling stations
- Drug stores
- Eating and drinking places
- Hardware and farm implement stores
- Lumber and building material retailing
- Liquor stores
- Retail florists
- Jewelry stores
- Fuel and ice retailing
- Miscellaneous retail trade
- Not specified retail trade[6]

G. Finance, Insurance, and Real Estate
- Banking and other finance
- Insurance
- Real estate

[5] Includes suburban and interurban railways.

[6] May include some returns not specified as to whether the workers are in wholesale or retail trade.

INDUSTRIAL CLASSIFICATION FOR REPORTS FROM INDIVIDUALS—*Continued*

H. Business and Repair Services

Advertising
Business services, except advertising
Automobile storage, rental, and repair services
Miscellaneous repair services and hand trades

I. Personal Services

Domestic service
Hotels and lodging places
Laundering, cleaning, and dyeing services
Miscellaneous personal services

J. Amusement, Recreation, and Related Services

Theaters and motion pictures
Miscellaneous amusement and recreation

K. Professional and Related Services

Educational services
Medical and other health services
Legal, engineering, and miscellaneous professional services
Charitable, religious, and membership organizations

L. Government

Postal service
National defense
Federal government n.e.c.
State and local government

M. Nonclassifiable

Nonclassifiabe

PLANS FOR VITAL STATISTICS IN 1940

By Halbert L. Dunn, M.D.
Chief Statistician, Division of Vital Statistics, Bureau of the Census

If the funds authorized by the Congress for taking the Sixteenth Decennial Census are appropriated, the Division of Vital Statistics of the Bureau of the Census will have an opportunity to conduct certain special projects in the years 1940 and 1941. Tentative plans encompass fourteen such projects, together with nine serial monographic publications resulting from them.

JUDICIAL AND CRIMINAL STATISTICS

The principal innovation in respect to judicial and criminal statistics is the creation of a national register of criminals who inhabit Federal and state prisons. This will be accomplished by the compilation of a file of individual record cards from the data supplied by Federal and state prison officials. The register will be kept up-to-date currently so that the status of the prison population can be known at all times. Ultimately, it is hoped that a complete prison history of each inmate will be available for purposes of statistical research.

In addition to this innovation a sample study is planned which will delve into the possibility of collecting statistics on the criminal court proceedings by individual case reports. This sampling study will be conducted in at least three jurisdictions, and will replace in these areas the usual methods of reporting. If this project proves successful, it will make possible a more complete analysis of the dispositions made in the courts.

Still another sampling study will be conducted in order to obtain statistical data on the prisoners received and discharged from local jails. The object will be to describe the characteristics of the jail population in the United States. Even though the study is carried out on the prisoners of only a few jails, it is anticipated that certain general interpretations can be made.

MENTAL INSTITUTION STATISTICS

In conjunction with the regular work on the statistics of mental institutions, somewhat more extensive information than formerly will be collected on patients in hospitals for mental diseases and also on the mental defectives and epileptics in mental institutions. The primary aim for the year 1940 will be to make available a maximum amount of information at an earlier date than has been possible heretofore.

A new element in the plan for 1940 is to obtain individual returns on patients dying in mental institutions. Since these will be tabulated individually, it will be possible to correlate the cause of death with the type of mental disease.

To facilitate comparability of the data, city and county hospitals and those for veterans, as well as state hospitals, will be circularized.

MARRIAGE AND DIVORCE STATISTICS

The Division of Vital Statistics, in formulating its plans to resume the collection and tabulation of marriage and divorce statistics, is now making a study of the kinds of data at present obtainable from the marriage and divorce records of each state. From about half the states individual records giving fairly complete data may be obtained. The minimum facts of age and residence for each individual are available in all states.

Tentative transcript forms for gathering these data have been designed. The proposed contents of the forms are:

> For marriage, provisions are made for the return of the following particulars for each person: Name, residence, color or race, age, prior marital status and number of this marriage, birthplace, occupation and industry, birthplace of father and mother, and occupation of father and mother.
>
> For divorce, the schedule, in addition to the facts of time, place, and circumstances of the marriage and divorce, time of separation, number of children, and the like, provides for the following data for each person: Name, residence at time of marriage and of divorce, age, number of this marriage, birthplace, occupation and industry.

Every effort will be made to obtain transcripts for all marriages and divorces in the United States in the year 1940. If feasible, identical transcript forms will be used throughout the country. Twenty-eight states now have central registration of marriage, and sixteen of divorce. In these, the records of the central register may be transcribed. For the remainder it would be necessary to go to county officials.

COMPUTATION OF RATE VOLUME BASED ON THE COMBINED EXPERIENCE OF THE YEARS 1939, 1940, 1941

The major purpose of this study will be to produce a monograph which will make available vital statistics data for small geographic areas at a time when correct population figures will also be available for such areas. To provide more stable statistics of this nature, birth

and death rates will be computed from the average number of births and deaths for the years 1939, 1940, and 1941.

NATALITY AND MORTALITY RATES FOR 1900–1940

Considerable demand exists for a volume which will give important natality and mortality rate data over long time periods. Depending somewhat upon the subject matter dealt with by the various rates and also upon the availability of population estimates for small areas and specialized classifications, the periods covered in parts of this volume will vary. The more stable rates will cover the time period 1900–1940; the less stable, 1920–1940 and 1930–1940. It is anticipated that the monograph resulting will closely parallel a similarly arranged monograph on population estimates which will be prepared by the Population Division for corresponding time periods.

SPECIAL TABULATIONS BY PLACE OF RESIDENCE

The Division of Vital Statistics has gradually expanded its tabulations of birth and death by place of residence since 1935. For the year 1940, all tabulations dealing with areas smaller than states will be transferred to a residence basis. In a few exceptional instances, these data will be tabulated both by residence and by place of occurrence. Tabulations for 1939, 1940, and 1941 will provide a large amount of data upon a residence basis, which will be included in the monograph for vital statistics rates in the rate volume based on the combined experience of the years 1939, 1940, and 1941.

It seems wise at this time to publish a monograph which will present a careful analysis of the problems involved in residence allocation. Many of the arguments for and against the use of residence as a statistical device need careful scrutiny before data tabulated on a residence basis are accepted as more satisfactory than those based on place of occurrence. This is particularly true because the allocation of deaths and births by residence is so largely a matter dependent on arbitrary definition. A critique dealing with the significance of the statistics allocated by place of residence is essential and timely in order to prevent widespread misinterpretation of these data.

COMPARABILITY OF MORTALITY STATISTICS

The International List of Causes of Death was revised at a conference held in Paris during the fall of 1938. Many changes in the List were effected. These are almost sure to result in a shift of the statistical frequencies in the tablulation of deaths during the next decade. Similar

discontinuities in the time trends of mortality rates have appeared in the official statistics at previous decade revisions. The delegation from the United States pledged that the effect of the revision of the List upon the mortality statistics of the United States would be evaluated. The ideal time to fulfill this obligation is in 1940.

A monograph will be published dealing with the various elements affecting the comparability of mortality statistics before and after the adoption of the most recent revision of the International List of Causes of Death. The monograph will also deal, insofar as possible, with the effect of the former revision of the International List in previous decade intervals. Revisions of the Manual of Joint Causes of Death, trends in the reporting of multiple causes of death, and the evaluation of accuracy and completeness in the reporting of causes of death will also be dealt with in the monograph.

OCCUPATIONAL MORTALITY

A considerable demand has been expressed by the public for occupational mortality statistics. This arises mostly from a desire to obtain information concerning deaths resulting from occupational hazards. Sampling studies by the Division within the last few years have demonstrated that accurate occupational mortality statistics cannot be obtained by use of the occupation as stated on the death certificate. Consequently, a special project is planned which will unite the mortality findings of workers dying shortly after the population census enumeration with the occupation as listed on the census schedules. This study will be attempted for selected local areas only.

FATAL ACCIDENTS AND THEIR CAUSES

The data concerning fatal accidents now shown on death certificates will be analyzed more completely than previously. Attempts will be made to obtain more accurate and complete information by follow-up queries. Insofar as possible the certificates of fatal accidents will be collected more promptly so as to release accident facts at an earlier date than is now feasible.

Special supplementary schedules for fatal accidents will be devised and proposed to state health departments for their use. Schedules of this nature will be tried out in local areas before being recommended for general adoption. For a few of the more frequent types of fatal accidents, case study techniques will be inaugurated so as to determine the underlying causes.

VITAL STATISTICS FOR OUTLYING POSSESSIONS

At present the Bureau of the Census receives and publishes data on births and deaths for Hawaii and the Virgin Islands, and on deaths for Puerto Rico. The census period will be used to determine the completeness of registration in all outlying possessions. In addition, transcripts of birth and death certificates will be obtained, as well as special infant cards by census enumerators for children born in December, 1939, and January, February, and March, 1940.

These special activities will be summarized in a compilation of vital statistics for outlying possessions. Moreover, the sum total of what is known concerning the vital statistics of these possessions will be accumulated and brought together in a monograph, since this material is now widely scattered. Pertinent information concerning health organizations and vital statistics laws will also be included.

EXTENSION OF INFORMATION ON DEATHS IN INSTITUTIONS

During the past several years, the Division of Vital Statistics has tabulated mortality statistics according to the hospital or institution where death occurred. The name of the hospital or institution is given on the death certificate. Consequently, it has been possible to build a national index of all these institutions.

The American Medical Association has cooperated with the Bureau of the Census to achieve this purpose by making available information on hospitals which is listed in its records. It is now necessary to circularize the hospitals and institutions so as to correct and bring up to date the knowledge concerning them. These facts will then be related to information on births and deaths. Tabulations will be made by geographic areas.

SPECIAL TABULATIONS FOR IMPORTANT DISEASES

Special tabulations are needed for certain diseases, such as cancer, heart disease, maternal mortality, infant mortality, tuberculosis, etc., in order to meet the needs of public health and welfare groups wrestling with the problems of control. It is likely that a small group of special monographs will be developed, one for each of these diseases. In this way, more complete information for these causes of death can be supplied than would otherwise be possible.

DEVELOPMENT OF TECHNIQUES FOR COLLECTION OF DATA BY USE OF MICROFILM

In the last few years, microfilm equipment has been introduced into the Bureau of the Census. So far, its use has been confined to the pres-

ervation of records. A project is planned for a study directed at the adaptation of microfilm technique to the collection of vital statistics data. Many technical difficulties must be solved before the Division can use microfilms of birth and death certificates instead of the hand transcripts now collected.

If microfilm can be adapted to the needs of the Division, it will mean the elimination of numerous errors in transcription. It will also speed up the transmission of vital statistics from the state office to the Bureau of the Census and make possible the preservation of exact copies of the original certificates by the Bureau.

Experiments will also be undertaken in the distribution of unpublished data by means of microfilm to libraries and to research workers. This will make possible much research work on original data which would not otherwise become readily available to the public.

ENUMERATION-REGISTRATION CHECKING PROJECT

Associated with the 1940 census of population, a test will be made of the completeness of birth registration and the degree of under-enumeration of children under one year of age. It is planned to collect special transcripts of birth from the state health departments for the months of December, 1939, January, February, and March, 1940. An infant report card for babies born during these four months will be collected by the enumerators as they take the population census of 1940. The transcripts of birth and the infant report cards will then be matched. This task will be a sizable one, since there will be approximately 800,000 of each. Transcripts of death for infants born during this period will also be collected and matched. These will number approximately 30,000.

The matching process will be done in Washington by alphabetizing both sets of cards. In so far as possible, the residue of unmatched cards must be followed up by letters and actual field visits in the states in order to determine the reasons for failure in enumeration of infants or registration of births. This will be a field task of magnitude and will necessitate cooperative endeavor on the part of those official agencies interested in social studies throughout the country.

A monograph is planned which will make available an analysis of this material. The study will involve a critical review of the completeness of birth registration as well as an evaluation of the accuracy of enumeration of newborn infants. Moreover, all the facts on the birth certificate can be studied in connection with the information collected in the Sixteenth Decennial Census.

With the knowledge resulting from such a project, it will be possible

to obtain completeness in birth registration within a relatively few years—a goal which heretofore has seemed unattainable short of five or six decades.

The preliminary evaluation of technique suggested for this project was made in a special census conducted in Marshall and St. Joseph Counties, Indiana, in the fall of 1939. The results from this test proved to be unusually valuable.

COMPLETENESS-OF-REGISTRATION DRIVES

As a corollary to the information which will be collected on completeness of registration for each county of the United States, it is planned to make a drive for completeness of registration on a nation-wide basis. This is the most important single problem facing the Division of Vital Statistics. Unless the public can be educated to the necessity for birth registration, complete and accurate reporting cannot be obtained.

Exact information about their particular community is the most essential element needed for the education of people in a local area. Consequently, the educational campaign for a nation-wide drive on completeness of birth registration can be greatly strengthened by the publication of a county statistical release summarizing the statistical information in which the residents of the county are interested. Experience has proved that it is possible to catch the interest of groups of citizens in local areas and enlist their aid in campaigns of birth registration for their localities when the facts are laid before them. In areas where the population is widely scattered, it might be necessary to combine the information from several counties into a district tabulation. It may also be desirable to make leaflets for large metropolitan areas. The essential objective is a consistent release which will permit comparisons of local areas with other areas, especially with the particular state and the nation as a whole. County releases will be prepared in such a form that they can be bound in a consecutive series.

The information collected for each county will be placed on summary punch cards, so as to make possible the publication of a volume of graphs and maps for important vital statistics data. Each map will present visually some one important statistical fact, such as the birth rate, or death rate. Accompanying tables will correlate this fact with other data such as percentage of illiteracy, density of population, and other factors.

Manifestly, the county release and the graphic analysis of the facts collected in this way will be of great help in the work of agencies other than the Bureau of the Census. The local birth registration campaigns will benefit both directly and indirectly as a consequence.

THE ANALYSIS OF ECONOMIC TIME SERIES*

By Gerhard Tintner
Iowa State College

The problem of the analysis of economic time series has occupied the attention of a great number of economists, mathematicians and statisticians, since the time when a considerable amount of statistical data became available in this field. It is probably one of the most unfortunate circumstances for our science that most economic data come in the shape of time series. Hence they cannot easily be dealt with by the ordinary statistical methods which have proven useful in other statistical applications, especially in physics and biology.

The most important reason these methods are inapplicable is very simple to understand. Items of data which are ordered in time are in general not mutually independent or random in time. They violate one of the most significant assumptions required in the application of probability theory on which all modern statistical tools are founded. Possible methods of analyzing interrelated statistical events have not yet been very fully explored, in spite of the fact that some progress has been made especially by the Russian school of probability. (Markoff chains.[1]) In practical statistical problems as distinguished from theoretical probability questions, we are far from satisfactory solutions. Other features may also be present, which make the application of statistical methods difficult. The variance of the population, for instance, may not be constant in time.[2]

There are two problems to be distinguished in the analysis of economic time series. The first is one which this material has in common with all other statistical data. This first problem is an investigation of the random character of the data, e.g., the separation of the random and the non-random parts of time series. There are still many workers in the field of economic statistics who fail to realize fully the great importance of this problem. It arises from the fact that only an answer to the question of what is and what is not random in a time series can

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[1] J. V. Uspensky: *Introduction to Mathematical Probability*, New York, 1937, pp. 301 ff. See also A. A. Markoff: *Wahrscheinlichkeitsrechnung*, Leipzig, 1912, pp. 272 ff.

[2] G. Tintner: *The Variate Difference Method*, Bloomington, Indiana, 1940, pp. 161 ff. See also R. Zaycoff: "Ueber die Ausschaltung der zufaelligen Komponente nach der 'Variate Difference' Methode," *Publications of the Statistical Institute for Economic Research*, State University of Sofia, 1937, No. 1, pp. 86 ff.

enable us to apply modern statistical methods which deal essentially with random phenomena and random samples.

The development of these modern statistical methods[3] constitutes possibly the greatest advance of the theory of statistics over the older English school of Karl Pearson and his followers. The initiative came from Professor R. A. Fisher,[4] but fundamental contributions have also been made by J. Neyman and E. Pearson in England and H. Hotelling and S. S. Wilks in this country.[5] These methods enable us to decide, solely on the basis of the data, the question of what is essential and what is due only to chance fluctuations.

We have, for instance, the theory of statistical estimation.[6] There are procedures which, on the basis of the statistical material, give the estimate of, say, the parameters of a frequency distribution which is the "best" estimate in a certain sense. Fisher and others have put forward several criteria which the estimate that has been calculated from the sample must fulfill, in order to be considered "best." To give an example: Suppose for instance we want, for some reason, to get an estimate of the true mean of a normally distributed population, of which we have a sample. The "best" estimate in a certain sense will be the arithmetic mean of the sample. It is a consistent estimate because it has the following property: The probability that the difference between the sample mean and the true population mean exceeds an arbitrarily small value becomes smaller and smaller as the size of the sample is increased. We can make this probability as small as we like by making our sample large enough. This is the criterion of consistency. Other criteria have also been stated.

Another problem is the testing of hypotheses.[7] Again, purely on the basis of manipulations of our samples, we can determine if a certain definite economic hypothesis is refuted by the data. Here we have to distinguish two kinds of errors. One type arises if we reject a hypothesis which is really true; and the second type exists if we do not reject a hypothesis which is false. Modern statistical theory deals with both types of errors.

[3] See especially: R. A. Fisher: *Statistical Methods for Research Workers*, 7th edition, London, 1938. G. W. Snedecor: *Statistical Methods*, Ames, Iowa, 1938. S. S. Wilks: *Statistical Inference*, Princeton, 1937.

[4] R. A. Fisher: *op. cit.* See also: "The Logic of Inductive Inference," *Journal of the Royal Statistical Society*, Vol. 98, 1935, pp. 39 ff.

[5] J. Neyman: "Outline of a Theory of Statistical Estimation Based on the Classical Theory of Probability," *Philosophical Transactions of the Royal Society of London*, Series A, Vol. 236, 1937, pp. 333 ff. H. Hotelling: "Relations Between Two Sets of Variates," *Biometrika*, Vol. 28, 1936, pp. 321 ff. S. S. Wilks: *op. cit.*

[6] R. A. Fisher: *Statistical Methods for Research Workers*, *op. cit.*, pp. 7 ff. S. S. Wilks, *op. cit.*, pp. 51 ff.

[7] S. S. Wilks, *op. cit.*, pp. 87 ff.

We have as a special case of testing hypotheses the theory of tests of significance.[8] It is possible, to state from the point of view of an arbitrary probability level, which has been chosen in advance, whether a certain economic hypothesis is rejected by the data or not. Tests of significance have been developed for testing means, variances, correlation coefficients, etc., and they have been used very widely in biological research.

But statistical estimates, tests of hypotheses and tests of significance depend essentially on the investigation of the *random character* of the time series. We may, for instance, try to separate our series into a random and a non-random part. Some knowledge about at least the order of magnitude of the random elements is desirable for many statistical purposes.

This problem has been dealt with somewhat satisfactorily mainly in two different ways. The first is the Variate Difference method as proposed by "Student" and O. Anderson.[9] This method is essentially based on the assumption that the systematic or non-random part of the time series is such that it can be wholly or partly eliminated by finite differencing. It is a very well know fact that a polynomial can be entirely eliminated by forming enough differences. But the Variate Difference Method demands such behavior in a restricted neighborhood only. It is not necessary that the *whole series* behaves like a polynomial over the entire range.[10] The two authors mentioned above developed this idea statistically by the large sample approach (standard errors). I tried to give recently an extension of it which may be applicable even in the case of short series.[11] It gives exact tests of significance, but is not "efficient" in the sense of Fisher's criterion. I propose to make selections from the data and to utilize only part of the available material, in order to create artificial independence. Some of the available information is hence lost and the method is not efficient.

The other approach is from the point of view of serial correlation and was first investigated by Yule.[12] A recent book by Wold[13] presents a very extensive treatment of this interesting subject, which is closely related to the investigation of differences and also to harmonic analysis.

[8] S. S. Wilks, *op. cit.*, pp. 71 ff.

[9] "Student:" "The Elimination of Spurious Correlation Due to Position in Time or Space," *Biometrika*, Vol. 10, 1914, pp. 179 ff. O. Anderson: *Die Korrelationsrechnung in der Konjunkturforschung*, Bonn, 1929, See also G. Tintner, *The Variate Difference Method*, Bloomington, Indiana, 1940.

[10] G. Tintner, *op. cit.*, pp. 7, 106.

[11] G. Tintner, *op. cit.*, pp. 73 ff, 124 ff. See also: "On Tests of Significance in Time Series," *Annals of Mathematical Statistics*, Vol. 10, 1939, pp. 139 ff.

[12] G. U. Yule: "Why Do We Sometimes Get Nonsense-Correlations Between Time Series," *Journal of the Royal Statistical Society*, Vol. 89, 1926, pp. 123 ff.

[13] H. Wold: *A Study in the Analysis of Stationary Time Series*, Uppsala, 1938.

The practical statistical, as distinguished from the probability, aspect of this theory has been, however, very much neglected. It is still far from a solution which is reasonably satisfactory for the application of modern statistics to practical problems. The mathematical difficulties involved are very great.

But even if the problem of separation of the non-random from the random part of the time series has been solved we are still left with a problem of an entirely different nature. It is often desired by economic statisticians to analyze the non-random part of economic time series further into its components.[14] The components which have been distinguished conventionally are: The seasonal with a period of 12 months, the business cycle with a period of between 3 and 10 years, and the trend and longer waves with long periods. (Kondratieff.[15]) Several procedures have been proposed for the separation of those components. But the methods of analysis up to now seem not to be very satisfactory.

In order to deal systematically with all these problems it is necessary to state a few criteria by which the statistical methods employed ought to be judged. I would like to propose as the first: It is desirable that the procedures used in the analysis of economic time series should *make sense from the point of view of the economist.*[16] I realize fully that this is a very big order. In economic time series, we are dealing essentially with dynamic and risk phenomena[17] which have not yet received a very satisfactory treatment even in economic theory. Still less is known about them quantitatively. I think we should try, nevertheless, to develop our methods in such a way that they make sense from the point of view of non-static economic theory.

We should remember that the statistical methods used in physics or in biology or in any other field must also make sense from the point of view of these particular sciences. If we take, for instance, the statistical investigation of the Mendelian rules in genetics, we find that the statistical assumptions are consistent with physiological facts and biological theory. In the same way the procedures of quantum statistics are consistent with the physical theory of the atom, etc. We should apply the same principle in economics, where this is, however, somewhat more difficult to do.

I have tried recently to suggest a tentative explanation of the pos-

[14] W. C. Mitchell: *Business Cycles, The Problem and Its Setting*, New York, 1927. S. Kuznets: "Time Series" in *Encyclopaedia of the Social Sciences*, New York, 1935. J. A. Schumpeter: *Business Cycles*, New York, 1939, Vol. 1, pp. 193 ff.

[15] N. D. Kondratieff: "The Long Waves in Economic Life," *Review of Economic Statistics*, Vol. 17, 1935, pp. 105 ff.

[16] O. Morgenstern: *Wirtschaftsprognose*, Vienna, 1928.

[17] J. R. Hicks: *Value and Capital*, Oxford, 1939.

sible economic meaning of the random variations in economic time series:[18] They can be understood only from the point of view of dynamic economics. Mitchell, Kuznets, Schumpeter, Haberler, and others have given rather good economic explanations of the character and properties of some of the nonrandom components of economic time series, like the trend and the cycle.[19]

A second principle for the analysis of economic time series follows from the rather unstable nature of economic phenomena in the course of time. The relations and conditions are probably different, for instance, in different phases of the business cycle[20] and also with a period of rising or falling price and production trends. We should put forward as the second criterion for the analysis of economic time series: The statistical methods used in dealing with economic series ought to be *as flexible* as possible.

I am, therefore, rather skeptical about the advisability of fitting trends according to some rigid formula or of using periodogram analysis which assumes fixed periods. It seems probable, on the other hand, that under certain circumstances, e.g., the fitting of a logistic as a trend would make sense, especially if the phenomenon described is connected with population growth which probably follows more or less this particular mathematical law. Periodogram or Fourier analysis, which assumes fixed and stable periods, may be applied with some advantage in the investigation of seasonal variations, which fulfill to a certain extent these conditions.

But these are exceptions. I think I would agree with Kuznets[21] and Frisch[22] about the necessity of using very flexible methods in the analysis of economic time series. I have always found moving averages rather convenient.[23] Simple moving averages of stable length could be used for the elimination of the seasonal. Moving averages with empirically determined, variable length, may be useful for the elimination of the cycle. But I am also more or less in sympathy with the methods of Kuznets[24] and Wald[25] for eliminating the seasonal, and with the new National Bureau methods for investigating the cycle. (Mitchell,

[18] G. Tintner; "A Note on Economic Aspects of the Theory of Errors in Time Series," *Quarterly Journal of Economics*, Vol. 53, 1938, pp. 141 ff. See also: *The Variate Difference Method*, *op. cit.*, pp. 4 ff.

[19] W. C. Mitchell, *op. cit.*, S. Kuznets, *op. cit.*, J. A. Schumpeter, *op. cit.* Also: *The Theory of Economic Development*, Cambridge, Mass., 1934. G. Haberler: *Prosperity and Depression*, New and enlarged edition, Geneva, 1939.

[20] G. Haberler, *op. cit.*, pp. 5 ff.

[21] S. Kuznets, *op. cit.*, especially p. 635.

[22] R. Frisch: "A Method of Decomposing an Empirical Series into Its Cyclical and Progressive Components," this JOURNAL, March 1931, Supplement, pp. 73 ff.

[23] G. Tintner: *Prices in the Trade Cycle*, Vienna, 1935, pp. 22 ff.

[24] S. Kuznets: *Seasonal Variations in Industry and Trade*, New York, 1933.

[25] A. Wald: *Berechnung und Ausschaltung von Saisonschwankungen*, Vienna, 1936.

Burns.[26]) It is my feeling that all these methods have enough flexibility to enable us to get a rather good, if rough, approximation to the various components in question. The results should, however, be interpreted with great caution. It has been pointed out that there is almost always some interrelationship between the different nonrandom components, e.g., between seasonal and cycle, or trend and cycle. This ought to be taken into account and it is by necessity neglected in most of the methods mentioned above.

The fitting or orthogonal polynomials[27] does not seem to be applicable in economic time series. It probably lacks the necessary flexibility. It may, in some cases, give an indication of the secular trend but it would certainly be almost impossible to fit polynomials to series containing large business cycles. The method of periodogram analysis seems to be not much more promising, since it postulates the existence of a fixed and stable period which probably does not exist in economic cycles. It remains to be seen if methods involving stochastic difference and differential equations (Wold, Frisch, Tinbergen, Kalecki)[28] can be used. These ideas recently introduced have even been made the bases of some business cycle theories.

Apart from the investigation of isolated economic time series, we have also the problem of the relationship between several series. The correlation methods which are much in use, often yield nonsensical results because of serial correlations in each single series. This danger has already been pointed out by Yule.[29] The items of the series are of course not independent of each other in the statistical sense. To give an example: We cannot assume that in a series of prices the price in one year is independent of the price in the preceding year. The same holds true if we take out the trend: The deviations from the trend are still not independent in the statistical sense.

It is my own feeling that the idea of correlation is, by necessity, restricted to the *random parts* of the series which are investigated.[30] The random elements contained in the series may be correlated and correlations between the random parts of several series may be analyzed by ordinary statistical methods and can be interpreted from a

[26] W. C. Mitchell and A. F. Burns: "The National Bureau's Measures of Cyclical Behavior," *National Bureau of Economic Research*, Bulletin 37, July 1, 1935. See also the forthcoming book by these authors.

[27] R. A. Fisher: *Statistical Methods for Research Workers*, *op. cit.*, pp. 148 ff. See also: M. Sasuly: *Trend Analysis of Statistics*, Washington, 1934.

[28] H. Wold: *op. cit.* R. Frisch: "Propagation Problems and Impulse Problems in Dynamic Economics," in *Economic Essays in Honor of Gustaf Cassel*, London, 1933, pp. 171 ff. J. Tinbergen: "Annual Survey: Suggestions on Quantitative Business Cycle Theory," *Econometrica*, Vol. 5, July 1935, pp. 241 ff. M. Kalecki: "A Macrodynamic Theory of Business Cycles," *ibid.*, Vol. 3, July 1935. pp. 327 ff.

[29] G. U. Yule: *op. cit.*

[30] A. A. Tschuprow: *Grundbegriffe und Grundprobleme der Korrelationstheorie*, Berlin, 1925.

probability point of view. Some difficulties, which may arise, could possibly be overcome by appropriate selections of items spaced through the series in such a way as to avoid some of the interdependence between successive items of a single series.[31]

But there is, in my opinion, no possibility of applying statistical methods based upon probability theory to the study of the relationships between the *nonrandom parts* of two or more economic time series. This nonrandom part, i.e., the trend, cycle and seasonal, is not random in time in economic data. The items of the nonrandom series are, therefore, not mutually independent. Hence statistical methods which assume independence cannot possibly be applied in the investigation of the relationship between the nonrandom parts of two or more economic time series. It would be a good idea to follow the example of the French statisticians and use the term covariation in the investigation of relationships between nonrandom variables.[32]

We can, of course, if we wish, calculate the correlation coefficients and fit regression lines for nonrandom variables or also for variates which are to a great extent nonrandom like most economic series are. This gives us a fit, which is the "best fit" in a conventional and mathematical sense, i.e., from the point of view of the method of least squares. This is to say, we simply minimize the sum of squares of the deviations. But these deviations from the fitted line themselves are not random, but they are in general arranged more or less according to a definite pattern. It will be the case that, for instance, a positive deviation will more frequently follow a positive than a negative deviation. It is hence impossible to give a statistical or probability meaning to our results. Correlation coefficients which reflect this relationship can in no case be interpreted with meaning from the point of view of the modern theory of statistics. There is no way of estimating the significance of such measures. Difficulties arising from the fact that the data are not normally distributed can be dealt with much more easily.[33] Problems of lags and especially distributed lags have still to be treated from the point of view of modern statistics. The interesting question of the true dimensionality of a set of variates, which has been raised by Frisch, awaits also still an answer from this point of view.[34]

[31] G. Tintner: *The Variate Difference Method*, *op. cit.*, pp. 124 ff.

[32] See e.g. G. Darmois: *Statistique Mathématique*, Paris, 1928, pp. 258 ff.

[33] H. Hotelling and M. R. Pabst: "Rank Correlation and Tests of Significance Involving No Assumption of Normality," *Annals of Mathematical Statistics*, Vol. 7, 1936, pp. 29 ff. M. Friedman: "The Use of Ranks to Avoid the Assumption of Normality Implicit in the Analysis of Variance," this JOURNAL, Vol. 32, 1937, pp. 675 ff. W. A. Wallis: "The Correlation Ratio for Ranked Data," *ibid.*, Vol. 34, 1939, pp. 533 ff.

[34] R. Frisch: *Confluence Analysis*, Oslo, 1934. See also: T. Koopman: *Linear Regression Analysis in Economic Time Series*, Haarlem, 1937.

I am afraid this restricts very much the field of applicability of modern statistical methods as far as economic time series are concerned. We are, in general, not much interested in the random parts or chance fluctuations of the series which are small and in most cases economically not very important. There are, of course, some important series which depend essentially upon random factors, like the weather, and are an exception. They can be dealt with by ordinary statistical methods. But, in general, the economically important and more significant part of the series is exactly the nonrandom part which is the effect of the more permanent causes in economic life. But it cannot be treated by the present statistical methods at all. The only hope for the future lies in the development of appropriate statistical methods which could enable us to deal with this problem very different from those met in the natural sciences and especially in biology. The blind application of statistical methods which have proven useful in other fields under entirely different conditions is not justified. It will be necessary to develop new methods which are better adapted for the peculiar situation in economic statistics. This is a great intellectual challenge to the economic statistician. He should not overlook, however, the fact that the logical and mathematical difficulties in his path are considerable.

We may, finally, mention the methodological importance of statistics for economics. There is no possibility of using experimental methods in this field; the separation of the effects of several influences present is frequently impossible; the *ceteris paribus* of the theory is hardly ever fulfilled. Statistics could be used as partial substitute for the experimental method of the natural sciences. We can actually test statistically economic hypotheses and indicate the degree of probability with which the data do not reject our assumptions, if we are aware of the limitations involved in modern statistical methods. It is obvious that this is very important for the problem of induction in economics.[35] In order to use inductive methods, we must, however, have consistent economic theories. These theories can be formulated as the economic hypotheses which we attempt to test by statistical methods. It has already been pointed out that these methods themselves should not contradict economic experience, and should be set in such a way as to make possible a check on economic theories.[36] The importance of theory for the application of statistics appears very clearly.

[35] See on the general problem of induction especially: E. Nagel: *Principles of the Theory of Probability* (International Encyclopedia of Unified Science, Vol. I, No. 6), pp. 60 ff. and the literature quoted there.

[36] This has been pointed out very clearly for the statistical derivation of demand curves by: G. Stigler: "The Limitations of Statistical Demand Curves," this JOURNAL, Vol. 34, 1939, pp. 469 ff.

PRACTICAL DIFFICULTIES MET IN THE USE OF EXPERIMENTAL DESIGNS*

By A. E. Brandt
Acting Chief, Conservation Experiment Stations Division, Office of Research, Soil Conservation Service, United States Department of Agriculture

The practical difficulties met in the use of experimental designs which I shall discuss are those which I have met in agricultural field trials. They may be placed in three categories for convenience: First, those met with in securing the adoption of modern designs; second, those involving proper selection and execution of modern designs once they have been adopted; and third, those found in the analysis of results.

My own experiences with difficulties of the first class lead me to believe that they are due to one or more of the following causes: the failure to accept the fact that all living material is dynamic and hence inherently variable; the attitude that generalizations of practical value cannot be based on results of plot studies but must be based on results from fields approximating in size ordinary farm fields; the feeling that the expense of replication is out of proportion to its value; the idea that the use of randomization is a confession of ignorance on the part of the experimenter which leads to confusion; and the attitude that the purpose of an experiment is to show an interested public that some conclusion, previously drawn by the research worker or arrived at by some person or committee in authority, is true. These reasons are not entirely independent, in fact they are more or less pieces from the same bolt of cloth.

Those who feel that only large fields should be used do not agree as to what constitutes a large field. I am reminded of one man who, after a number of years of successful endeavor in experiment station work, arrived at the conclusion that 10 acres was a minimum. He decided further that, given one field of 10 acres or more for each treatment or variety, he could by great care and extreme precision secure results that could be used with confidence as the basis for an action program. In an experiment involving three treatments he was faced with the fact that the cost of installation of equipment prohibited the use of plots larger than one half acre. To insure that the plots for this experiment should be comparable, a group of soil and crop experts looked over about 1000 acres of farm land and finally selected the

* A paper presented at the 101st Annual Meeting of the American Statistical Association, Philadelphia, December 27, 1939.

three plots which in their opinion were most nearly comparable with respect to slope, exposure, depth and type of soil, and previous cropping history. The installation of equipment was delayed so long that a uniform planting of oats had to be made on all three in the fall. For awhile the plots behaved on a relative basis of 1 to 1½ to 2 which shook the experimenter's confidence in the choice of plots but not in his method of experimentation. Later, the plots performed on a relative basis of 2 to 1¼ to 1 and then skipped about a good deal. This behavior shook his confidence in single field-size-plot experimentation to such an extent as to make him receptive to an explanation of modern experimental designs.

In a discussion of the proper method for sampling the farms in the drainage area of a stream, the statement was made by one man that he and his co-workers had proved that a random sample would not suffice. The proof, he explained, was based on the drawing of two random samples of 5 each from 100 cards, 50 of which were marked upland and 50 lowland. The first sample resulted in 5 upland cards being drawn and the second resulted in 5 lowland cards being drawn. When I pointed out the small probability that two such samples would be drawn in two random drawings, I was told that the drawings had not been made but that since such a result was possible they felt that randomization could not be used. An opportunity was thus afforded to explain that it is not necessary to discard pertinent information when drawing random samples.

In one of the States some new work was to be started with the purpose of contrasting soil depleting and soil conserving methods of culture. The quality of the crop was to be an important factor in deciding between the methods tested, a common feeling being that some soil could well be sacrificed in order to insure proper drainage and hence desirable quality. The working plan that was submitted provided for but one plot for each treatment variation—to which we objected rather strenuously. Among our objections we may have mentioned that the person concerned did not exhibit the proper appreciation for modern experimental designs. At any rate we received the following statement: "We are fully aware of the value of replications in experimental plot work, however, if we are limited by a lack of funds to only twelve plots it would appear more important to secure some idea of the loss of soil and water under a wider range of conditions between treatments than to secure more accurate results with a few treatments." In defence of this attitude he said, "Even without replicates I would expect to get

significant differences. . . . " It seemed to us that he had already drawn his conclusions with regard to the relative value of the treatments being proposed for testing. Hence, in response, we questioned the propriety of spending research money for the purpose of demonstrating previously drawn conclusions which these people apparently had in mind.

Having convinced a research worker or group of workers that some ways of performing experiments are more efficient than others, difficulties in directing their activities along those lines arise. Naturally, having been converted, these persons take up the study of experimental design in a serious way. Their progress in this study often can be traced by the changes in design of the experiments they conduct. It is particularly easy to determine when the study of split-plot experiments has been taken up, for such experiments then spring up all over the place with results not always appreciated in advance by the experimenter. For instance, at one of our southern experiment stations a study of spacing of cotton plots in the row and rates of application of fertilizer was started. Four replicates were used with each block divided into three major plots to accommodate the three spacings and each major plot split into three minor plots for three rates of application of fertilizer. The structure of the experiment and the analysis of results may be specified as follows:

	Degrees of freedom
Major plots	
Blocks	3
Spacing	2
Error (a)	6
Minor plots	
Rates	2
Rate × spacing	4
Error (b)	18
Total	35

The tests of significance relative to spacing are not very precise since they are based on but 6 degrees of freedom.

Inquiry revealed that an almost solid stream of cotton seeds is planted in the row, the desired spacing being accomplished by chopping after emergence. Since there was no practical reason for using a split plot design, we proposed that each block be divided into nine plots and that the nine rate-spacing combinations be assigned to them at random. The outline of the analysis follows:

	Degrees of freedom
Blocks	3
Spacing	2
Rate	2
Rate × spacing	4
Error	24
Total	35

All tests of significance can now be made with greater precision than with the split plot design. The same number of plots, number of observations, and area of ground are involved in the two designs. The man who designed the experiment seemed a bit chagrined that the split plot design suffered by comparison in this case.

Even when a proper design has been chosen and some one in authority has ordered that it be used, the man in the field may assign the treatments in all replicates in a set order as a, b, c, a, b, c, etc. or he may use random arrangements in all but one replicate. In the remaining replicate he will use his judgment as to the proper arrangement. A method of arrangement used somewhat frequently is to array the treatments with respect to efficacy and the plots on the basis of productivity, and then place the best treatment on the poorest plot and so on until the poorest treatment is placed on the best plot. When asked for the logic of this arrangement this last spring, a worker in one of our eastern States said that if under these conditions the treatment on the poorest plot produced a better yield than the one on the best plot he did not need any statistical analysis to feel certain that it was a superior treatment. He was unable to answer the question as to what he would conclude if the treatment on the poorest plot failed to do better than the one on the best plot.

Experiments that are to be repeated at a number of locations, such as in a number of States, get modified rather frequently. Substitutions of varieties or treatments are commonly made. In one case in which the plots were to have been 100 feet long, the plots in one replicate were divided into two parts 25 feet and 75 feet long with about 50 feet between them.

The difficulties that have been given so far have all resulted from lack of knowledge of the purposes and requirements of efficient experimental designs. This may have produced the impression that persons well versed in and having the proper appreciation of modern experimental designs never have any difficulties. Of course this is not the case. This last year a competent worker in the Department of Agriculture brought me the data from a three-dimensional quasi-factorial

design in which he had used four groups of sets instead of three. Naturally, he encountered difficulty when he tried to analyze his results. He was considerably chagrined to find that the increase in the number of replications, for which his experimental facilities were quite adequate, had nullified the ordinary method of analysis rather than increased the precision of his experiment as he felt he had a right to expect. He had no difficulty with the analysis after we pointed out that it could be done by discarding either member of a certain pair of his four groups but he still felt cheated at not being able to use all the data he had collected. How to analyze the results from this experiment using all the data gathered is a problem of real practical value yet of enough theoretical interest to challenge a mathematical statistician.

Not all difficulties with experimental designs are traceable to the experimenter alone. Some must be shared by the statistician or statisticians on whom the research worker has relied for advice and guidance in his work. A common fault of the more enthusiastic students of experimental design or of the less practical statisticians is to advise that a design of precision much greater than the material warrants be used. For example, at the recent meetings of the American Society of Agronomy in New Orleans, a prominent plant breeder who has used many of the complex designs, stated that he felt that some of these designs which require a large number of replications, such as the lattice, provide unduly precise comparisons in a given year at a given place since the variations from season to season and from place to place are relatively greater than the local soil variations.

Mathematicians and especially mathematical statisticians seem to gain pleasure and satisfaction from developing and presenting a new solution for a problem previously presented by another. Though this is a legitimate and laudatory mathematical occupation, it frequently causes confusion among practical users of statistics who do not have sufficient mathematical training to realize that the results are the same and that the selection of the method to be used may be largely a matter of personal preference. We had an example of this on our program at Detroit a year ago. In one of the sessions, two papers were given dealing with tests of simple Mendelian inheritance. The same data were used in both papers but in one, simple commonly-used arithmetic methods were employed, while in the other, a much more elegant mathematical treatment was used. The conclusions, however, were the same,

An interesting proposal for the use of Chi-square as a coefficient of relative variability has come to my attention several times recently. Given the yields of v varieties of a crop, replicated b times in a ran-

domized block experiment, it is proposed to treat the bv squares, $(x_{ij}-\bar{x}_{.j}-\bar{x}_{i.}+\bar{x})^2$ $[i=1, 2, 3, \cdots, b; j=1, 2, 3, \cdots, v]$, as independent estimates of error variance from which a value of Chi-square is calculated following, in general, the method presented by Clark and Leonard,[1] Snedecor,[2] and others. This value is defined as an index or coefficient of variability corresponding to $(b-1)(v-1)$ degrees of freedom.

For the above conditions $\sum(x_{ij}-\bar{x})^2=\sum(x_{i.}-\bar{x})^2+\sum(x_{.j}-\bar{x})^2+\sum(x_{ij}-\bar{x}_{1.}-\bar{x}_{.j}+\bar{x})^2$ is an identity. The three terms in the right member are mutually independent quadratic forms of rank $(b-1)$, $(v-1)$ and $(b-1)(v-1)$ respectively. Further, the ratio of each to σ^2 is distributed in random samples from a normal population, as is Chi-square with the number of degrees of freedom equal to the rank of the form in question. The third term of the right member may be separated into $(b-1)(v-1)$ quadratic forms each of rank one and each of these measured in terms of σ^2 is distributed as Chi-square.

Each time, the proposal has been brought to my attention by practical users of statistics who had become confused by the apparent contradiction. They have in each case, stated that the $(b-1)(v-1)$ mutually independent contributions to the error variance seemed to them to provide a more logical basis for calculating Chi-square than the squares of the bv deviations which are evidently not mutually independent. Though such confusion will be straightened out and is by no means fatal, it does delay the acceptance of our science by many scientific investigators for whom it should prove most useful.

[1] Clark, Andrew, and Warren H. Leonard, "The Analysis of Variance with Special Reference to Data Expressed as Percentages," *Journal of the American Society of Agronomy*, Vol. 31, No. 1. January 1939.

[2] Snedecor, G. W. *Statistical Methods*, p. 196 Ames, Iowa: Collegiate Press. 1937.

THE USES OF THE CENSUS OF BUSINESS

Summary by Paul T. Cherington

THE Uses of the Census of Business" was the subject of discussion at a joint meeting of the American Statistical Association and the American Marketing Association on December 29, 1939, during their annual meetings in Philadelphia.

As an experiment in program making each person had been assigned a specific phase of the use of Census material, particularly in marketing work, and asked to submit in advance to the Assistant Director a list of questions or observations about the use he had made or hoped to make of Census data. The discussions were supposed to be developed out of these questions and observations. The plan worked well in the sense that most of the speakers and Dr. Reed had already exchanged views and were ready to give the session the results of their previous consideration of the subject in hand.

The session opened with a presentation of the aims and purposes of the Census of 1940 and particularly of the Census of Business by Dr. Vergil D. Reed. In part Dr. Reed said:

"Any factor which contributes to the better coordination of production, distribution, and consumption, to sounder planning and policy building on the part of individual concerns and business as a whole, or to any reduction of waste in effort or in wealth, is a contribution to business and to public welfare. We believe that the Census of Business and the other censuses which constitute the Sixteenth Decennial Census are such contributions.

"As examples of items introduced into the Sixteenth Decennial Census which makes it a more useful body of social and economic statistical data, the following will serve:

(1) The Housing Census (The entire housing schedule except for the questions on tenure and radio set represents an addition to the Census program and should prove a gold mine for economists and sociologists alike.)
(2) Wage or salary income for wage or salary workers
(3) Last grade of school completed
(4) Migration statistics based on the reporting of place of residence on April 1, 1935
(5) Employment status, in considerable detail, of the whole population 14 years old and over, based on a cross-section week, namely the last week of March
(6) Questions having a bearing on farm tenure status which will accu-

rately determine differences between croppers and other types of tenants

(7) The number of farm workers employed on specific dates, divided into farm families, labor, labor by the month, by the day and other including piece work

(8) The availability of electricity and the farms reporting electricity

(9) Detailed questions on crop failure which will furnish adequate basis for crop insurance and the most important point of farm security

(10) Additional information on age and stability of retail establishments

(11) New data on consumer credit through coordination of censuses of retail trade and sales finance companies supplemented by additional data to be included in the Bank Call Report for December 31, 1939, through the cooperation of the Federal Deposit Insurance Corporation, the Federal Reserve Board, and the Comptroller of the Currency.

"I have been greatly pleased with and well repaid in going over the great amount of correspondence upon which this program has been based. In reducing their thinking to writing those who are participating in this session have undoubtedly added much to the clarity of their conclusions. The preparation of replies to the various letters has served the same purpose for Census officials and the interchange of correspondence, I hope, has furnished all of us with new viewpoints and a better understanding of our mutual interests and problems."

The first speaker for the users of the Census was Carl Dipman, Editor of the *Progressive Grocer*, who spoke on the "Use of the Census of Business by Retailers." A few paragraphs from Mr. Dipman's interesting discussion were the following:

"Large individual retailers and multiple store operators find a great deal of use for the Census information. They are able to go directly to the reports and get the information they want. Average sized and small retailers seldom make direct use of the voluminous Census volumes.

"Small retailers need the benefits of the tremendous amount of information revealed by the Census reports, particularly the ups and downs of different kinds and character of stores and the trends that are revealed by comparing one Census with the previous one. But inasmuch as it is impractical for the average small retailer to dig these facts out himself, it seems to have fallen upon trade associations and publishing houses to do the work for these retailers and then pass on to them the conclusions.

"In our particular field we have been especially concerned with the type of stores that are accumulating a large proportion of the food business. We have seen the slight decline of general stores, in most

cases developing into food stores, and the slight decline of grocery stores and specialty food shops in favor of combination stores. The trend has been particularly significant to all retailers, and we have dramatized it in innumerable ways. In fact, there is so much demand for current information on food retailing that we attempt to extend the outstanding figures from year to year. Each year we get out a folder, 'Facts in Food and Grocery Distribution,' in which the outstanding statistics of the food industry are estimated, all originally, of course, based on the Census of Business. So the Census reports supply an excellent background for the activities of publishing houses and trade associations. In fact, most of us can hardly estimate the value of the Census reports because they supply the background for the editorial enterprises we carry on.

"The final question that arises is how frequently the Census of Business should be taken. Naturally we would like to have it every two years, yet I doubt whether the tremendous cost of a Census justifies taking it every two years. On the other hand it has been suggested that a Census of Business be taken every ten years. That in my opinion is not frequent enough. Were the Census now taken every ten years we would still be dealing with 1929 figures, and certainly anyone can see how inadequate 1929 figures would be as a basis for projecting present day operations. From the retailer's viewpoint I most earnestly urge that the Census of Business be taken every five years, and I believe all of us who are of that mind should not hesitate to express ourselves."

Alfred Byers, of the National Electrical Wholesalers' Association spoke on the "Use of the Census of Business by Wholesalers." Some of his main points were: "First . . . the character of these data is such as to recommend the desirability of limiting lapses of time between each census to the shortest practicable period.

"The next point is whether . . . trends or changes in wholesaling are reflected accurately by the census reports. Generally speaking it seems fair to say they are, at least to an extent comparable to that reached in similar reports published under non-government auspices. Care and sound judgment are used by the officials in the Bureau of the Census in arranging for the best possible samples upon which to base such reports as would reflect trends and changes. Explanatory notes simplify interpretation of published figures and indicate factors and unusual conditions relating to the data. Accuracy is a matter of degree. Census reports can be used to judge trends and changes in wholesaling to a reasonably high degree of accuracy. Obviously, the more repre-

sentative and inclusive the information returns of a single industry are the greater will be the degree of accuracy of the final reports for that industry.

"The value of *special* Census reports is point number three. In the case of Electrical Wholesaling the Census reports have had definite value. Naturally the cooperation of the industry itself has been as responsible for that perhaps as the Bureau of Census' painstaking efforts toward that end. This industry has thrived on technology and facts. It appreciates particularly the need for the latter. Through the willing assistance of the Bureau we have today special reports that not only are dependable but are in general use. These reports help those in this industry to do a better job of buying and selling; and financing and managing. The geographical sub-division of data and their commodity classification or breakdown tend to make reports valuable locally as well as nationally. That fact would seem to be highly praiseworthy for after all, the bulk of the industry is composed of its many local, independent wholesalers serving relatively small areas.

"The final point to be touched is the possibility of improving the Census data from a wholesaling standpoint. . . . One suggestion is being made repeatedly. It is that there should be some finer distinction made between self-termed wholesalers and wholesalers as generally defined within the industry. Operations of the two types do differ and combining the data reported by both has been said to reduce the possible accuracy of reports."

Dr. Frank Surface, Standard Oil Company of New Jersey, in discussing the "Use of the Census of Business by Manufacturers with Direct Selling Problems," called attention to many features of the Census and of the material which it makes available with suggestions which had occurred to him as a result of his years of experience as Chief of the Bureau of Foreign and Domestic Commerce.

Victor H. Pelz, General Foods Corporation, in discussing the "Use of the Census by Manufacturers Selling through Wholesalers" recounted his experience and made various suggestions. He said in part:

"This company certainly has made use of previous Census, especially the 1935 Census. We have made extensive use of all the figures published by the Census relative to sales by food stores, especially sales of grocery, combination and country general stores with food departments. The figures in Volume 3, which are given by counties, have been particularly useful to us because they have enabled us to set up these figures on a basis which corresponds very closely to the outlines of our own sales territories. In addition, we have gone further and

have had the census give us special breakdowns by groups of counties, showing the number and sales of grocery, combination and country general stores by size brackets. We are contemplating asking for a similar breakdown of the 1935 figures with regard to restaurant and eating places in principal cities, in order to give our Institution Department a better idea as to the proportion of total restaurant business which can be reached through the larger and more important eating places.

"Some time ago we secured from the Census an analysis by states of sales of food as compared to non-food made by country general stores. This has been also extremely useful to us in estimating more accurately the volume of food products that goes through stores of this kind.

"All this information has been useful to us in a number of ways: (a) in enabling us to determine the areas in which we have made relatively the greatest progress and the least progress, in terms of potential as measured by the amount of money which people spend for food; (b) the figures as to number of stores by size groups have enabled us to allocate retail salesmen to various territories more accurately than before; (c) from the figures as to the amount of independent versus chain store business we have been able to tell whether we were getting the right proportion of sales through both kinds of retail outlets.

"I am going to list some things we would like to get from the Census that are probably not feasible, either from the standpoint of expense or of inability to get reliable data.

a. It would be of tremendous help to all manufacturers of grocery products, like ourselves, if we could get from the Census separate figures showing by counties the number and sales of grocery and combination stores, instead of having these included with all other food outlets. There are many manufacturers, like ourselves, who are interested in total figures for all food outlets. But there are many more, including ourselves, who are interested in figures concerning grocery and combination stores *or* figures concerning fruit and vegetable stores, *or* figures concerning dairy products stores, etc.
   Since grocery and combination stores are by far the most important food outlets, separate figures concerning them would increase the value of the Census immensely to all manufacturers. Admitting that a breakdown by counties would raise numerous disclosure problems, I think this could be satisfactorily met for everybody if, when disclosure is involved, grocery and combination stores were shown together in a single figure. This was the device used in the special tabulations made for us by the Census, and the results certainly were satisfactory.
b. It would also be of considerable value to all manufacturers selling

through food outlets if a separate breakdown by counties were available of chain versus independent stores; if this breakdown could be shown for grocery and combination stores, separately from other kinds of food outlets, so much the better.

c. Despite the difficulties involved, grocery manufacturers would be very much interested in having the commodity sales figures repeated in 1940 that were given in the 1930 Census. Despite their limitations these figures would be extremely useful, even if based on relatively small samples. I think that one reason why these figures from the 1930 Census were not used more extensively was simply that they were a brand new gadget in market analysis and hence were unfamiliar to many people who, in the last ten years, have come to understand and realize their importance as instruments in analysis and control.

d. So far as the food industry is concerned, I think we would all like to have a more detailed and careful distinction made between major types of wholesale outlets. While considerable improvement has been made recently, the wholesale census figures with regard to voluntary chains, retailer-owned wholesalers, chain store warehouses, and manufacturers' sales branches, still leave me with a feeling of frustration, based upon the belief that distinctions have not been drawn with sufficient care. I know the difficulties that are involved in educating field personnel on these questions and of framing schedules so that they will be universal in application. But it would be worth while to consider the possibility of using two, or perhaps three wholesale schedules for major groups or kinds of businesses that have common characteristics. For example, I think that the schedule for wholesale enterprises in food and related industries might well be separated from the schedule for wholesale enterprises in metals, hardware and other similar industries, since separation would permit more accurate fitting of schedules to industry structure and characteristics.

e. In the 1935 Census figures regarding food chain stores by size groups were made available only for the United States as a whole. We would much like to have such figures made available by states, just as was done for independent stores."

Hector Lazo, Executive Vice-President, Cooperative Food Distributors of America, was unable to attend the session in person, but his correspondence with Dr. Reed brought out many interesting points:

"It seems to me that very definitely the Census will have to give us a basic concept of the average independent grocery store from the point of view of the grocery store that is actually devoted to grocery business, and not the farmer's stands and gasoline stands and other units that are not included in the over-all definition of food stores. We

should have these averages by states, and wherever possible by large cities, so that it will be possible to establish within regions and within given areas the average food and grocery store from the independent point of view, as compared with the chain, and also the average food and grocery store on the basis of the family type grocer as contrasted to the supermarket whether chain or independent.

"From our point of view, if we could have such business censuses even on the spot-check system every two years it would be most helpful, but every five years would be most important.

"The national averages have for a long time been almost useless to us because the situation is so very different. From the point of view of the national economy as well as the social economy of the Nation, it is most important, for example, to note the average sized stores in such regions as the Pacific Northwest and compared with the Middle Atlantic States, and the type of stores whether on a cash-and-carry basis, or whether the full service stores predominate, whether the wages are predominantly high or low, whether the delivery service predominates—all these items which would be of great interest to us if it were possible to break them down accordingly."

P. V. Jesters, of the A. C. Nielsen Company, covered most of his subject by means of his correspondence with Dr. Reed. As a wide user of Census data his suggestions were largely concerned with improvement in form for the use of market research organizations and services.

Professor D. M. Phelps closed the session with a discussion of the "Use of the Census by Teachers of Marketing and Kindred Subjects." He said in part:

"The previous speakers have shown how the Census of Business is being used by business concerns, and by research organizations which service them. In part, at least teachers of marketing subjects should use the census data in like manner or demonstrate these uses to students through lectures, textbooks, or preferably, through actual case studies which are gathered from the companies which do use the data. If teachers of marketing subjects can discern value in the uses to which the data are being put, if they believe that the result will be a more effective administration of the marketing work of business enterprises, then . . . these uses will find a place in the advanced courses in marketing such as sales management, market analysis and advertising.

"But the Census of Distribution and the Censuses of Business which followed, do have uses for the marketing teacher which would not be emphasized by the marketing practitioner or the research

worker. First, they are being used, and very successfully, to implement description of the marketing system. . . . Although many studies of marketing costs and of channels of distribution had been made over the years prior to 1929, still the wealth of factual data then secured and, subsequently, through the other censuses immensely augmented the ability of the teacher to describe and evaluate the marketing system, both as a whole and for particular types of product. There is ample evidence of this in the newer marketing books.

"An adequate understanding of the marketing structure at any one time also must include knowledge of the changes which are taking place and there are many. . . . In the present century we have seen a marked growth of chain stores, numerous changes in wholesaling, for instance, the emergence of newer types such as truck jobbers or those which feature 'cash and carry,' a trend toward direct marketing, and a growth of the producer cooperatives. Now we are witnessing the growth of supermarkets and of consumer cooperatives, and the attempt on the part of small, independent retailers to protect their position through legislation. Until 1929 we lacked adequate quantitative evidence of changes such as these. Then we were furnished the picture for one year through the Census of Distribution. But when the data became available for a series of censuses such as we had for 1929, 1933, 1935, and will shortly have for 1939, *trends* could be observed in the use of different distribution channels, the cost of marketing, and so forth.

"If the censuses continue to be taken more frequently than decennially, and if the accuracy of the data furnished continues to improve, we may be able to discern not only trends but shorter term movements likewise. For instance, we would like to know the effect of varying degrees of depression on marketing costs and on consumer debt on installment accounts. Information on consumer debt is being collected for the first time in the forthcoming Census. Perhaps the data might give some indication of the effect of various marketing laws on competing channels of distribution. With biennial data such as we have in the Census of Manufactures, the effect of many short term influences might be discernible.

"In this connection I am heartily in favor of the tentative decision of the Bureau of the Census to prepare special studies on the quantitative aspects of various marketing institutions or movements. Oftentimes the material is so scattered that the student fails to get significant items. I do not doubt but that the teacher and the business research worker have similar experiences. If the data on producer's cooperatives,

voluntary chains, and supermarkets, for example, could be isolated in special publications, it would be immensely helpful for teaching purposes and, particularly, for direct student use. As most teachers know, it is necessary to make data highly available before students can be induced to go to the necessary bother to get it.

"Finally, there is one manner of use which has not been specifically mentioned by the speakers of this session. It is the use which we will make of the material of the Censuses more or less unconsciously. The facts which we learn from the Censuses at any one time will condition our thinking from that time forward. Our knowledge of the marketing structure and of marketing procedures has been vastly augmented, and this knowledge, whether we will it or not, can not but affect decisions on marketing policies, and procedures for putting those policies into effect. Allyn A. Young once said 'that the new knowledge which our researches yield has to be fitted into, not merely added onto, a comprehensive view of economic life.' Some of the blank places have been filled by data from the Census of American Business. Thus our view of an important sector of our economic life is more comprehensive than it has been. As a result we are more effective business men and, I hope, more effective teachers likewise."

STATISTICAL NEWS AND NOTES

Studies of the Temporary National Economic Committee

The Temporary National Economic Committee[1] is having the various member Government agencies and independent experts prepare some thirty monographs for its use, covering such subjects as: concentration of production, basing point system, Government purchases, housing, insurance, labor costs and labor restraints, patents, price flexibility, trade associations, problems of small business, etc. The main purpose of these studies is to analyze facts pertaining to the concentration of economic power in and financial control over the production and distribution of goods and services in the United States. Two of the completed studies[2] are summarized below.

A four-volume report entitled *Price Behavior and Business Policy*[3] considers the impact of business policy upon the behavior of commodity prices and the significance of price behavior to the functioning of the economy. It describes the manner in which the policy decisions of businessmen can affect the focus of competitive rivalry, the level and movement of prices, and the character and variety of goods produced for consumption. It seeks to define the issues involved and particularly the meaning of the concept of price "flexibility"; and discusses the extent to which differences in price behavior reflect intrinsic market characteristics or business policy decisions, the impact of these differences upon the problems of depression and recovery, and some of the public policy issues involved. It describes the extent to which businessmen, by their sales policy decisions, have directed competitive effort into channels other than price and the significance of various aspects of non-price competition upon the general standard of living. Particular attention is devoted to the institution of price lines, the significance of brands, advertising, and trade-marks, and the manner in which competitive effort is constantly redirected as particular modes of competition become unlawful or inexpedient. An analysis of the conditions influencing the markets for certain kinds of electrical household equipment is included in the report as a specific illustration of the factors which must be considered by businessmen in their price policy decisions, and the consequences of such decisions to the economy.

The report includes two appendixes. The first presents fourteen measures of price flexibility for the various commodities included in the Bureau of Labor Statistics wholesale price index and analyzes some of the relationships existing between these various measures. Appendix 2 is devoted to a detailed analysis of the practice of price lining, particularly in the apparel industries.

[1] The Committee was set up by a joint resolution of the House and the Senate, No. 113 of the 75th Congress, approved June 16, 1938.

[2] These reports have not been formally submitted to the Temporary National Economic Committee, and for this reason are not available for general circulation.

[3] Prepared by the Bureau of Labor Statistics for the Temporary National Economic Committee.

The monograph entitled *The Status of Housing in the United States*[4] sets forth the economic problems affecting housing and the deterrents to the maximum operation of the industrial units that go to make up the housing industry. Except as they converge on the economic problems, the social aspects of housing are not discussed. The testimony presented at the hearings, as well as information gathered in the course of investigations, is evaluated in the light of available statistical data which show the background of these problems. Previously published material is also reviewed in connection with testimony presented at the hearings and in connection with the problems discussed.

Among the subjects considered are: Volume of construction; relation of residential to total construction; market factors affecting residential building, such as incomes, rents, population growth, etc.; operation of the building industry; housing finance; technical trends; taxes; building codes; and public housing. Various solutions presented at the hearings are analyzed, and conclusions are drawn from the material presented. Recommendations concerning legislation and administrative action are also included.

Temporary National Economic Committee THEODORE J. KREPS

Central Statistical Board

The Central Statistical Board is organizing a survey of the important statistical information of the United States for the Statistical Section of the Eighth American Scientific Congress which is to be held in Washington on May 10–18, 1940, at the invitation of the Government of the United States. This will form a chapter in the compendium covering the statistics of 21 American republics represented at the Congress. The plan is to have a recognized expert in each important field of statistical information prepare a brief section for this chapter. The object of the discussion is to state the principal developments in statistical information during the past two decades or during some other more significant period, with special emphasis on new data which have filled important gaps, and major improvements in the comparability, organization, representativeness or comprehensiveness of existing series; to appraise the important statistical information (both governmental and private) that is now available; and to indicate what additional information is needed and what further improvements in existing data are necessary for a more adequate picture of social and economic change.

The 1940 Census of Population

On April 2, the same force of enumerators will begin taking the censuses of population, housing, and agriculture. The schedule for the sixteenth decennial population census will differ in several important particulars from that for the preceding one.

[4] Prepared by Peter A. Stone of the Work Projects Administration for the Temporary National Economic Committee.

Probably the most fundamental innovation is the inclusion of a set of supplementary questions that will be directed only to a random sample of 5 per cent of the population. This is the first time that a random sample has been utilized by a federal census of population as an economical means of securing additional data on the characteristics of the American people. The questions taken on a sample basis will be those whose tabulation by minor areas is considered unnecessary.

In keeping with the declining importance of the foreign-born, the group of questions dealing with nativity and parent nativity has been substantially restricted. Country of birth of parents and mother tongue will be ascertained for only the 5 per cent sample. The questions on year of immigration and ability to speak English have been dropped altogether. On the other hand, a group of queries on the contemporary problem of internal migration will be carried for the first time. The place of residence on April 1, 1935, will be determined for each person five or more years of age.

Similarly, since, in 1930, only about 4 per cent of all persons 10 years old or over were illiterate, the question on literacy is being discontinued, and a much more significant inquiry on the highest grade of school completed is being substituted. Each person will also be asked whether he or she has attended school or college at any time since March 1, 1940.

For the first time we shall be able to know something about the activity of every person 14 years old or over during a particular period (the week of March 24–30). Such persons will be classified as in the labor force or not in the labor force. Persons in the labor force will be classified as (a) at work or with a job or business, (b) assigned to public emergency work, or (c) seeking work, these last being subdivided into persons with work experience and new workers. Those not in the labor force will be recorded as (a) engaged in home housework, (b) in school, (c) unable to work, or (d) "others." Hours worked will be reported for persons at work during the week and duration of unemployment for those seeking work and for emergency workers.

For persons employed during the week, returns on occupation, industry, and class of worker will relate to the job at which they are employed; for persons seeking work, the last occupation, industry, and class of worker will be secured. Usual occupation, industry, and class of worker will be sought from the 5 per cent sample. Other related items include the number of weeks worked during 1939, the income from wages and salaries, and the receipt of income of $50 or more from other sources.

The set of questions taken on a sample basis will comprise several others in addition to those already mentioned. One will deal with veterans of the United States military forces and the wives, widows, and under-18-year-old children of veterans. Persons 14 years old and over will be asked if they have a Social Security number and if so the proportion of wages or salary from which deductions were made during 1939. Inquiries of all women who are or have been married on whether they have been married more than once, age at first marriage, and number of children ever born should provide valuable data for the study of differential fertility.

Bureau of Labor Statistics, U. S. Department of Labor

Prices and cost of living. The Bureau of Labor Statistics on January 25 announced the release of a daily index of wholesale prices of basic commodities. The series begins with August 28, 1939. The selection of the 28 commodities has been made with a view to confining the index as far as possible to items which were (1) basic, (2) freely traded in on open markets, (3) sensitive to changing conditions in these markets, (4) preferably free from dominant seasonal movements, and (5) sufficiently homogeneous or standardized so that uniform and representative price quotations could be obtained over a period of time. The index is a geometric average of price relatives, each series being given equal weight. It is computed with the average of daily prices in August 1939 as 100, in order to facilitate comparisons with prices prevailing in world markets before the declaration of war. Besides the 28-commodity index, there are five subgroups—import commodities, domestic commodities, domestic agricultural, foodstuffs, and raw materials. The figures are available each weekday, except Saturday, in the early evening by telephone or collect telegram, and are issued in a mimeographed report on Mondays covering the previous week's prices.

Indexes of subgroups of the Bureau's regular 813-commodity wholesale price index, formerly published only monthly, are now issued weekly. Revised price series of hosiery and chemicals and allied products are being incorporated in the index this spring. Mimeographed statements are available describing the revision, which involved an expansion in the number of items priced and improved specifications.

The weekly emergency collection of retail food prices begun in September was discontinued at the end of January. Prices of women's hosiery and men's socks, which are used in compiling the cost of living index, have been published from 1926 to date.

The reports of the *Study of Money Disbursements of Wage Earners and Clerical Workers* now being issued by the Bureau of Labor Statistics as Bulletins 636–641 inclusive contain data on incomes and summary data on expenditures and savings for families classified by income. Similar information and data on expenditures for individual commodities and services are presented for families classified by expenditure per adult equivalent. Bulletin 638 will give a summarization of the data presented separately for the 42 cities covered in this survey. Preliminary chapters of this report are now appearing in the *Monthly Labor Review* beginning with the December issue.

The reports of the section of the *Study of Consumer Purchases* conducted by the Bureau of Labor Statistics are appearing in three series. The income series (Vol. I of Bulletin 642–647 and 649) contain data on income, family composition, and rent and rental values of owned homes for families classified by income, occupation and family type for each of the 32 cities surveyed by this Bureau. The second series (Vol. II of Bulletins 642–647 and 649) contains summary data on current expenditures, and savings by size of city for each of six regions. Data on expenditures for individual items of food,

housing, clothing, medical care, transportation and miscellaneous items and on the components of savings for families classified by income, family type, and in some cases by occupation will appear in Bulletin 648, Volumes I–VIII as the third or technical series.

Employment and pay rolls and labor turn-over. Beginning with January, the monthly figures on labor turn-over have been secured in more detail than formerly. In addition to the plant employees previously covered, the reports will show figures also for clerical, sales and supervisory employees. In reporting accessions, the number of employees rehired after a separation of three months or less will also be shown separately.

Monthly indexes of employment and pay rolls in public utilities have been adjusted to levels shown by the 1932 and 1937 censuses. The former series "electric light and power and manufactured gas" has been revised from 1929 to exclude manufactured gas. Average earnings and hours have been revised accordingly. Indexes for retail trade, formerly weighted only for "general merchandise" and "other retail," have been weighted according to employment in 28 lines of trade and adjusted to census levels. Separate figures have been published for 25 lines of trade, for the years 1929, 1933, and 1935 through 1939, and for months since January 1935. The series for wholesale trade are being similarly revised.

Beginning in January, data have been compiled on construction projects financed by the Reconstruction Finance Corporation through the self-liquidating loan division.

In cooperation with the Civil Service Commission a study has been made of salaries of Federal employees receiving $2,000 or more. The survey covers employees in the District of Columbia and in the field, and presents analyses by age, sex, and occupation.

Wage and hour studies. Surveys of wages, hours and conditions of work are being made for automobiles, covering motor vehicles and auto parts; converted paper products; tobacco, including cigars, cigarettes, chewing and smoking tobacco, and snuff; and luggage and small leather articles.

The bulletins to appear on union scales of wages and hours in the building and printing trades will include also an analysis of union agreements in these trades.

Effects of minimum wage provisions of the Fair Labor Standards Act. An analysis of the economic effects of the 25-cent rate in the seamless hosiery industry appears as an article in this issue of the JOURNAL. Similar studies have been completed dealing with independent leaf stemming, cotton textiles, and sawmills.

Women's Bureau, U. S. Department of Labor

The Women's Bureau is conducting extensive field surveys of the fruit and vegetable canning and packing industries, including preparation of frosted foods and cold packing. Pay-roll data have been secured for 1938

and 1939, to show both week's earnings and hourly earnings. Usual length of the peak season, general source of the labor supply, distance of the plants from the fields of cultivation, and their location in or near towns or in the open country were ascertained.

Agents of the Bureau secured information from 567 canneries employing about 135,000 workers in the busy season, from over 600 packing plants having nearly 35,000 workers, and from 42 frosted-food or cold-pack plants with 7,000 workers. From the canners and packers the fluctuations from week to week throughout the year in pay-roll totals and in employment were obtained. In addition, the cannery records kept for Social Security purposes afforded information for more than 170,000 individual workers as to the number of weeks of employment and the year's earnings in 1937, indicated as the best recent year in the industry.

Major canning States visited were California, Indiana, and New York, and major packing States, Texas, California, and Florida. Other States included in one or both of the investigations were Arkansas, Iowa, Illinois, Maryland, Michigan, Minnesota, New Jersey, Ohio, Oregon, Pennsylvania, Virginia, Washington, West Virginia, and Wisconsin. Citrus fruit plants constituted about one-third of those visited, and also included were plants packing fresh apples, tomatoes, celery, lettuce, and mixed vegetables. Of the canned vegetables, almost three-fourths were tomatoes and tomato products, corn, peas, and beans; also visited were plants putting up other vegetables and canned soups, as well as peaches, pears, apricots, and other fruits and fruit juices.

The Women's Bureau is completing the tabulation of pay-roll data for September 1939 on the employment and earnings of 365,000 women in manufacturing plants in industries employing nearly two-thirds of all women in manufacturing. Data were mailed in by employers in the 12 major industrial States, on forms furnished by the Bureau of Labor Statistics. Published twice a year beginning in September 1937, this is the only series giving extensive data on women's average earnings both by the hour and in the week, and average hours worked. Also shown are the per cent changes in these items and in employment, in identical plants, over a year's period and over a 6-month period.

Bureau of Research and Statistics, Social Security Board

The Division of Economic Studies of the Bureau of Research and Statistics is continuing its work in bringing together statistical materials measuring the fiscal resources of the States and other economic factors which influence the participation of States in Federal grants-in-aid. The tax systems of the different States are being studied with reference to the types of tax bases used, rates of tax, and disposition of receipts. These fiscal data are related to other State economic indexes such as income payments. These materials will be used to bring up to date and keep current a previous publication of the Bureau, the *Fiscal Capacity of the States*. Work

has been completed for the States of Wisconsin, New York, Ohio, and Georgia.

A second project which is being carried on is an attempt to estimate the geographical incidence of the various Federal taxes, in order to measure the relative amount of funds which the Federal tax system extracts from the income flow of the different States. These estimates are being made for each year since 1929. In the case of the excise taxes the estimates are based in so far as possible upon available figures for consumption of the commodities taxed. The estimates for the various Federal liquor taxes have been completed, and it is expected that the estimates for other types of taxes will be completed in the near future.

Another project which is rapidly nearing completion is the development of State estimates of the distribution of income by income classes on the basis of data collected for 1935–36 in the *Study of Consumer Purchases* by the Agriculture and Labor Departments in cooperation with the National Resources Committee, and used by the National Resources Committee in arriving at estimates of the distribution of income on a national and regional basis, as published in *Consumer Incomes of the United States*, August 1936. The basic sample data from this study were analyzed to determine (1) for what States the sample data were sufficient for deriving these estimates; (2) for what States not sampled the data of similar neighboring States could be used; and (3) for what States additional sampling would be necessary. It was found that while additional sampling was desirable in some areas, particularly rural areas, the sample obtained was sufficient to permit preliminary estimates by States for purposes of comparison. Studies on a regional basis indicated that there was significant correlation between income distribution and type of community. Accordingly, State estimates by type of community were undertaken. Population estimates for each State by type of community (metropolises, large cities, middle-sized cities, small cities, villages and farms) were derived, and sample income distributions for each of these types have been obtained. By applying the sample distributions to these population estimates and combining the figures, estimates have been obtained for each State of the distribution of families and single individuals by income levels and of their income by income levels. Charts have been prepared showing the percentage distribution of consumer units and their income by income levels.

The Statistical Section of the Division of Health Studies has continued its studies of temporary disability, invalidity, and family composition. Additional tables have been constructed showing the relative volume of temporary disability for specified waiting periods and for specified maximum duration of illness based on American experiences not included in prior studies. The more important sources used are based on temporary disability experience reported by Keffer, Bassford and Fitzhugh. With respect to invalidity, former cost estimates have been revised in view of changes in the provisions of a possible invalidity insurance system and, also, in view of

more recent information from European experience on incidence and duration of invalidity.

With respect to the Family Composition Study, the series of 184 tables for the ten largest cities have been completed and it is anticipated that these will be reproduced for distribution to research students interested in basic statistical tabulations. The analysis of the entire urban sample has helped to clarify relationships among factors of family-size, composition and income in single family households (households in which all members are part of one bio-legal family). These results are published periodically in the *Social Security Bulletin*. A parallel analysis has just been completed for multi-family households, that is, households containing two or more bio-legal families.

Basic tables compiled from the annual statistical reports on the social characteristics of recipients accepted for old-age assistance, aid to dependent children, and aid to the blind during 1938–39, have been issued in processed form by the Division of Public Assistance Research. The data included in these tables will be analyzed and presented in articles in the *Social Security Bulletin*. Because of their administrative value to the States, however, these basic tables are made available in advance of the publication of the data in special articles. The last of a series of articles based on reports on the social characteristics of recipients accepted for public assistance during the fiscal year 1937–38 appeared in the November issue of the *Social Security Bulletin*. The article is entitled "Recipients Accepted for Aid to the Blind in 1937–38: Analysis of Grants, Assistance and Employment Status, and Arrangements for Education."

An article on "Comparative Costs of Administering Public Assistance: An Analysis of the Administrative Expenses of 28 Public Assistance Agencies During 1938–39" will appear in an early issue of the *Social Security Bulletin*. The data on which this article is based were obtained through the experimental reporting system for the collection of financial statistics on expenses and source of funds for public assistance, developed by the Division of Public Assistance Research, in which several State public assistance agencies have been participating voluntarily. The results indicate the importance of a uniform concept of administration, the need for accurate bases for prorating joint costs, and the importance of relating cost to performance.

Beginning with the February issue, the *Social Security Bulletin* brings together certain statistics of the social insurance programs under the Social Security Act, State unemployment compensation acts, the Railroad Retirement Act, and the Railroad Unemployment Insurance Act. Data on old-age and survivors insurance and State unemployment compensation have been published in the *Bulletin* since the beginning of these programs. Publication of data on the railroad retirement program was begun in the July *Bulletin* and on the railroad unemployment insurance program in the October *Bulletin*. The comparative scope of the programs and their combined impact will be shown better by these combined statistics.

Research and Statistics Division, Bureau of Employment Security, Social Security Board

The new statistical reporting manual which will be used for making the 1940 statistical reports has been issued to the State employment security agencies. This manual includes a complete set of forms and instructions to be used for reporting both employment service and unemployment compensation data. All of the tentative revisions in the statistical reporting program noted in the previous issue of this JOURNAL have been incorporated in the final draft of the regular reporting program. The Social Security Board will therefore be receiving for the first time data on potential and actual duration of benefit payments for all the States. The only report deleted was that pertaining to the classification of registrants in local offices according to the number of times placed in employment. This report has been made optional, and only a single item on the number of different registrants placed during the calendar year is being required. Employment and pay-roll series by State and industries are expected to be developed from the report on employment and wages in subject employment, for the 70 industry groups in the *Social Security Board Industrial Classification*. As noted in the previous issue of this JOURNAL, these data will be reported on an identical firm basis, and should provide useful bench marks of employment on a fairly current basis. The 1938 and 1939 data were reported on an aggregate basis, and despite the limitations of the information because of the delinquency reporting factor, have proved useful for comparative purposes to both the Bureau of Labor Statistics and the Bureau of Old-Age and Survivors Insurance.

Plans for regular tabulations of the 1940 data have been completed. It is proposed to issue a series of monthly, quarterly, semi-annual, and annual reports, which are intended to serve the needs of administrative personnel and students of employment security problems.

The papers which were delivered at the last annual meeting of the American Statistical Association in a round table conference on unemployment compensation contributions, benefits, and reserves, have been duplicated for release as a monograph.

Considerable attention has been given to the development of a body of actuarial data relating to employment, unemployment, and pay rolls for the period 1932 to 1939 inclusive, which will bring up to date the work done along these lines by the President's Committee for Economic Security. In addition, studies are being made of the effect of various legislative proposals which have been introduced in the current session of Congress.

Continued progress has been made in the field of industrial classification. Part 1 (list of industries) and part 3 (alphabetic index of products, establishments, and services) of the 1939 edition of the *Social Security Board Industrial Classification Code* have been completed. Copies have been distributed to all State employment security agencies for use in classifying unemployment compensation and employment service data.

Tabulations have been initiated on the summary of 1939 experience. Although the scope of this summary will be restricted to key items only, it will include data on claims, payments, contributions deposited, reserves available for benefits, applications, placements, and active file of job seekers. This summary will later be supplemented by a more extensive statistical monograph on employment security activities during 1939.

The issuance of the first report in the *Exchange Bulletin* series marks the inauguration of a new service to State research and statistics units in State agencies. The bulletin contains a digest of State research and statistical studies received by this Division, and State agencies are thus advised of research and statistical developments in the employment security program.

The *Employment Service News*, which is prepared and edited by the Division, has been re-named the *Employment Security Review*. The new name better describes the contents of this periodical, which appears monthly and contains brief articles of interest to persons engaged in employment security work.

Representatives of State employment security agencies in Region VII (Tennessee, Mississippi, Alabama, Georgia, Florida, and South Carolina) met in Jacksonville, Florida, on January 18-19-20. The State statisticians in this region participated in the meeting, and statistical problems, as well as research activities on seasonal unemployment, partial unemployment, and experience rating, were discussed.

An analysis of the effect of the use of an annual wage base, as against weekly wages or their equivalent, upon the distribution of the weekly amount of unemployment compensation benefit payments, is now nearing completion. This analysis incorporates the results of selected statistical studies undertaken by State research and statistics units. These studies were based on analyses of samples of the annual earnings of claimants as compared with the highest quarter earnings. The analyses disclose that workers with irregular employment and in the lower earnings brackets are adversely affected so far as amount of benefit payments is concerned when an annual wage base is used to determine the size of weekly benefit payment. A similar analysis of the experience of four States whose laws have been so amended leads to the same conclusions as those reached in sample statistical studies of State agencies.

Bureau of Old-Age and Survivors Insurance, Social Security Board

With the inauguration in January 1940 of the payment of monthly benefits under the Federal Old-Age and Survivors Insurance program, the Bureau has developed new procedures for the recording and tabulation of claims data. Some of these procedures are designed for the purposes of securing operating statistics and controls. However, the need for a large amount of data for actuarial estimates and valuations has resulted in the provision for rather elaborate statistics relating to the beneficiaries and deceased

workers. The data is expected to develop such information as death claim rates and retirement rates experienced and the composition of workers' families. Additional statistics will be prepared for other purposes such as the study of the adequacy of monthly benefits. Procedures have been designed to analyze the data by such factors as age, sex, race, type of benefit, and geographic location.

Detailed preliminary tabulations showing number of 1938 employees, their 1938 wages, their cumulative wages and the number of quarters within the year during which they were employed, by age, sex, race, state of employment, industry, and interval of earnings classifications, have been made for 15 States. Tabulations for the remaining States with summaries for each classification and United States recapitulations should be completed by early spring, at which time tables will be compiled for publication.

Tabulations of employer reports show the number of establishments, number of employees on the last payroll, and the total taxable wages for the reporting period. Tables for the first quarter of 1938 presenting these data by size of employing organization and size of community, and for the second quarter of 1938 and the first and second quarters of 1939 showing the same items by State and industry, have been completed and multilithed. Similar tables are in process for the third quarter of 1939. Persons interested in obtaining copies of these multilithed tables should address their requests to Mr. John J. Corson, Director, Bureau of Old-Age and Survivors Insurance, Social Security Board, Washington, D. C.

The use of the special form for prompt notice and proof of death for all holders of social security account numbers is now being placed on a nation-wide basis. Forty State vital statistics agencies had agreed to cooperate by the end of January and it is hoped that arrangements can be completed shortly with the remaining States. When this plan is in operation the Bureau of Old-Age and Survivors Insurance by a special arrangement with the Division of Vital Statistics of the Census Bureau will be able to coordinate its mortality statistics for holders of social security account numbers with those of the Census. This program will enable the Bureau to have a measure of the under-registration of deaths in the old-age insurance program in order to eliminate decedents from the records of covered workers. It will also enable the Bureau promptly to eliminate annuitants who die from the rolls and incidentally yield an evidentiary proof of death for adjudication purposes.

Office of Education

The two chapters of the *Biennial Survey of Education* for 1937–38, dealing with statistics of public high schools and statistics of State school systems, will go to the Government Printing Office in February or March.

Questionnaires are being formulated for a special study on the extent to which public schools are releasing or dismissing pupils for week-day classes in religious education and also for a survey of health services in the public schools.

In December, 1939, the Office of Education called a conference of representatives of the Bureau of the Census, the Central Statistical Board, Department of Agriculture, Social Security Board, Bureau of Employment Security, Public Health Service, Work Projects Administration, National Youth Administration, American Youth Commission, the Population Association of America, and American University to consider the use of cumulative pupil-record cards for research purposes in each field, provided proper items were entered periodically on these cards. It was decided to consider making a survey of the content and availability of completed cards that could be used for research purposes, making a collection of samples of such cards as the first step in deciding their usefulness to the organizations represented.

Division of Research, Work Projects Administration, Federal Works Agency

A study was conducted in 23 representative cities to determine how WPA workers have been affected as a result of the Congressional provision in the Emergency Relief Appropriation Act of 1939 which forbids continuous employment of certified workers on WPA projects for longer than 18 months. Over 775,000 WPA workers in the United States were dismissed from their jobs during July and August, 1939, in accordance with this provision, of whom more than 138,000 were covered in the survey cities. These workers were first interviewed about 3 weeks after their lay-off, and those not reassigned to WPA by the end of 2 to 3 months were again interviewed in November.

The first interview revealed that only 7.6 per cent of those discharged from WPA were employed in private industry and that 20 per cent had been granted direct relief. At the time of the second interview, 12.7 per cent of the same workers were privately employed, 28.4 per cent were on local relief rolls, and 26.7 per cent had been reassigned to WPA. Among the individual cities studied, the proportion with private employment ranged from 6.7 per cent to 17.0 per cent. Weekly wages earned by the employed workers averaged $17.22; nearly half of these workers were earning less than their former WPA wages.

United States Department of Agriculture

Mr. Meyer A. Girshick recently has joined the staff of the Division of Statistical and Historical Research of the Bureau of Agricultural Economics. His appointment is the first step in the development of a new unit in the Division designed to promote the use of improved statistical techniques. The Unit will service not only the professional workers of the Division, but also the Department Statistics Committee and other workers in the Bureau.

Rapid developments in technique make it difficult for workers busy on subject matter studies to keep up to date in the application of improved statistical methods. The Division intends to provide competent leaders in

the field of methodology who will keep in touch with the methods used in the Division, discover weaknesses and possible improvements, and work with the other researchers to effect a constant improvement in methodology.

It is also hoped that a staff of competent technical workers in statistical methods may be able to extend the frontiers of knowledge in this field, particularly in those phases of methodology having to do with the analysis of prices and other time series. It has come to be realized more generally in recent years that many of the statistical methods which have been developed as aids in the solution of problems in the natural sciences are not applicable without considerable modification to problems involving social data and especially time series. Some of the fundamental assumptions underlying the use of current statistical methods are not justified in connection with data of this character. It is hoped that statistical techniques can be developed which will overcome to some extent these difficulties.

Bureau of Agricultural Economics. Results of the Income Studies conducted by the Bureau of Agricultural Economics have been compiled and published during the last two years as required by the Agricultural Adjustment Administration Act of 1938. These estimates have now been brought together in a series of estimates of total cash income from marketings of farm products for the calendar years 1910–39. To round out the picture of farmers' income, estimates of additions to income in the form of food, fuel, and housing furnished by the farm will be published in the *Agricultural Situation.* The first of the series appeared in the December issue of the *Agricultural Situation.*

Agricultural Marketing Service. An appraisal of methods of gathering farm labor statistics by A. R. Sabin is published in the *Agricultural Situation* for December, 1939. Criticisms of present methods are presented and remedies suggested.

Graduate School. Mr. W. G. Cochran, formerly of Rothamsted Experimental Station in England and now at Iowa State College in Ames, Iowa, gave a series of lectures on Design of Experiments at the Graduate School January 3 to 10. The lectures were very well attended and many special problems were discussed in a series of conferences. These free lectures were made possible through the Graduate School and the Special Research Project on Statistical Methods under the Bankhead Jones Research fund administered by the Division of Agricultural Statistics of the Agricultural Marketing Service.

Commodity Exchange Administration

In 1939 the Commodity Exchange Administration began the weekly publication of a new statistical series showing the amount of unfixed call purchases and sales reported to the Commodity Exchange Administration by cotton merchants. This series makes generally available for the first time information on the volume of call contracts on which the "basis" but not

the "futures" price has been fixed. Such contracts have become increasingly important in the cotton trade in recent years. Under them cotton is sold at a specified premium or discount—the "basis"—with reference to a particular future. The final price is fixed ultimately by a transaction in the futures market, the price of which added to the basis determines the full amount which will be paid for the spot cotton. The option of determining the time at which the price will be fixed may rest with either the buyer or the seller, although the contract is used most generally in the sale of cotton to mills, the option resting with the mill. Because of the large volume of such contracts which are outstanding at any time the resulting price fixations may at times have a very important effect upon the futures market. The reported amount of such contracts as of January 19, 1940, for example, was 1,700,000 bales. The reports on which this series is based are received each week from cotton merchants who have a position in the futures market amounting to 5,000 bales or more in a single future. The use which has been made of this series since its inauguration has demonstrated its value as an aid to understanding the cotton futures market.

Board of Governors of the Federal Reserve System

Beginning with the January 1940 issue the *Federal Reserve Bulletin* has changed its appearance. A heavier colored cover has been substituted for the thin white cover; some of the department titles have been changed in wording and type; signed articles have been introduced; and a new department has been set up under the heading, "From the Board's Correspondence," giving selected answers to inquiries addressed to the Board. The general character of the *Bulletin*, and statistical data it presents, have not been changed. The signed article in the January issue was "The Gold Problem Today," by E. A. Goldenweiser, and the articles for the February issue were "The Par Collection System of the Federal Reserve Banks," by George B. Vest, and "Durable Goods Expenditures in 1939," by George Terborgh.

A considerable amount of work has been done by the Board's staff with a view to expanding the amount of information available for current business analysis. This program has taken two forms: the gathering of interpretive information through the Federal Reserve banks; and cooperation with other Government agencies in the improvement of commodity statistics.

Partly in connection with this work a conference of economists from the research departments of each of the Federal Reserve banks and from the Board's Division of Research and Statistics was held in Washington on January 2 and 3. The conference discussed the research and statistical work of the Federal Reserve banks with special reference to surveys and analyses of current business conditions.

According to present plans, the revision of the Board's index of industrial production will be completed and the figures published this spring. Most of the seasonal adjustment factors and several of the basic individual series

in the index are being revised; changes are being made in some series as a result of shifts in the usual number of days worked in the industries; and a few new series are being added.

A new edition of the *Federal Reserve Chart Book* was issued in December 1939 carrying data available on November 9, 1939. The price of the book is 50 cents.

Securities and Exchange Commission

In the Commission's *Fifth Annual Report*, tabulations have been added covering, on a monthly basis, all security offerings of over $100,000 irrespective of whether issues are registered or not. A breakdown was presented according to type of offering and type of security, together with a division into corporate issues, classified by main industrial groups, and non-corporate issues, classified according to broad categories of issuers. These tabulations carried forward through June 1939 statistics of security offerings which were originally published in "Selected Statistics on Securities and on Exchange Markets."

A new breakdown of registrations of each principal type of security according to the size of issue and the size of issuing company has been added to the annual summary of security registrations under the Securities Act of 1933 covering the calendar year 1939 and will be shown regularly in the future in quarterly releases. This breakdown makes it possible to determine the extent to which registered fixed interest-bearing securities and equity issues consist of comparatively small or large issues and whether they are issued by comparatively small or large companies.

A revised series of statistics of underwriting participations has been published for the twelve months ended June 30, 1939, supplemented by two quarterly compilations covering the third and fourth quarters of 1939. The primary aim of revision has been to broaden the coverage so as to include all underwritten issues registered under the Securities Act of 1933 for which there is a record of offering. Previously published series of underwriting statistics excluded issues of less than $1,000,000 as well as securities issued in connection with certain types of transactions such as exchange issues and securities registered for account of others than the issuers.

The Public Utilities Division of the Commission released a report on the corporate super-structure of registered public utility holding companies and a book of charts showing the location of operating electric or gas subsidiaries of 54 registered public utility holding companies and of the headquarters of those holding companies. The report on corporate super-structures consisted of a set of charts indicating the principal owners of 26 registered public utility holding companies; a brief discussion of ownership, without charts, was given for an additional 25 companies.

During the second half of 1939 reports on 45 additional industry groups based on the Survey (previously Census) of American Listed Corporations, a Work Projects Administration project sponsored by the Commission,

were made available for purchase at the Commission's rates for photocopies of filed documents. A list of the industry groups may be obtained from the Publications Unit of the Commission. (For indication of the content of these reports, see this JOURNAL, March 1939, page 121.)

During the second half of 1939 the Commission released most of Part III of its report on investment trusts and investment companies, dealing with "Abuses and Deficiencies in the Organization and Operation of Investment Trusts and Investment Companies." The chapters released specifically treated with (a) "Background of Investment Company Industry in Relation to Abuses," (b) "Detailed Histories of Various Investment Trusts and Investment Companies," (c) "Problems in Connection with the Distribution and Repurchase of Shares of Open-End and Closed-End Management Investment Trusts and Investment Companies," (d) "Problems in Connection with Shifts in Control, Mergers and Consolidations of Management Investment Companies," and (e) "Problems in Connection with Capital Structure." In addition, the Commission released four special reports dealing respectively with (a) "Investment Trusts in Great Britain," (b) "Investment Counsel, Investment Management, Investment Supervisory and Investment Advisory Services," (c) "Commingled Common Trust Funds Administered by Banks and Trust Companies," and (d) "Companies Sponsoring Installment Investment Plans."

Division of Tax Research, United States Treasury Department

The Division of Tax Research of the Treasury Department has published several studies in the *Bulletin of the Treasury Department*. The August 1939 issue contained an analysis of Federal and estimated State and local revenues and expenditures for general Government during the fiscal year 1938; the December 1939 issue reported the estimated amount of Federal, State and local securities outstanding as of June 30, 1939, interest on which is wholly or partially exempt from the Federal income tax; and the January 1940 issue presented an article on the estimated number and compensation of Federal, State and local officers and employees, 1937–1938.

The Income Tax Study Project in Philadelphia conducted under a grant of funds obtained from the WPA was outlined in the June 1939 issue of this JOURNAL at page 371. The data being analyzed, however, are from the 1936 income tax returns only and not from the 1936 and 1937 returns as was formerly indicated.

The Study was designed primarily for the compilation and tabulation of tax data hitherto unavailable or available only on a much more limited basis. The tables to be released by the Study were planned by an Advisory Committee representing several departments of the Federal Government and will be valuable sources of information in the fields of tax research, revenue estimating, national income, consumers' purchasing power and other related fields.

United States Tariff Commission

During the past year the Tariff Commission has issued in mimeographed form a number of reports, largely statistical, bearing on problems of current interest, such as United States trade with Germany. Statistical compilations relating to particular commodities have been released also; such statistics often are not to be found in print and must, therefore, be obtained directly from the trade by questionnaire or other method. The following reports are included in the list:

United States Trade with Germany
The European War and United States Imports
Analysis of Imports of Miscellaneous Chemicals
Statistics on Sugar
Analysis of Imports of Flower Seeds
Analysis of Imports by Parcel Post
Synthetic Organic Chemicals, United States Production and Sales, 1938

The report on "United States Trade with Germany" was issued in April 1939. It is a compilation of data on United States trade with Germany and other areas which had at that time been brought under the control of the German Government. The material relates primarily to about 300 individual classes of commodities imported in largest value from those sources into the United States. The detailed data on individual commodities is preceded by a brief general analysis of our trade, both import and export, with those areas. The report also contains a brief description of the much-discussed barter procedure in Germany's trade, and analyzes the probable effects of United States countervailing duties on imports from Germany effected through this procedure.

The report on "The European War and United States Imports" is a study of the probable effects of the present conflict in Europe upon United States imports. The report covers all imported commodities in which the trade in recent years was valued at more than two million dollars annually. Individual commodities have been examined to determine whether the foreign sources of current supplies are likely to be materially affected by the present hostilities and the possibility of obtaining supplies elsewhere or of using substitute commodities.

Since developments in the 1914–18 period are commonly regarded as a possible pattern for current developments in this country, an analysis of imports into the United States has been made in order to determine how far the current situation conforms to that of 1914. The analysis indicates far-reaching changes in both the United States and world economy and trade since 1914, and that for many commodities the effects of the present war, both in this country and abroad, will follow a far different pattern from that of the last war.

The reports on chemicals, flower seeds, and imports by parcel post consist

of analyses of imports under several so-called "basket clauses" of the Tariff Act of 1930. The actual commodity composition of such groups of imports have not been published in official statistics and are now compiled for the first time. The report on parcel post imports has reference to informal entries (less than $100 each) at 24 principal ports of entry for the last quarter of 1937 and at the port of Baltimore for the full year of 1937. Such imports have amounted to over several million dollars a year.

The Tariff Commission has continued its survey program for various industries and during the past year has issued reports on "Grapes, Raisins, and Wines" and "Incandescent Electric Lamps." These reports are extensive economic analyses of the industries under reference and follow in general the same pattern as similar surveys issued by the Commission in former years, such as those on chemical nitrogen, flat glass, sodium sulphate, mica, iron and steel, cutlery products, and synthetic resins, previously referred to in this JOURNAL. Other studies of a similar nature are nearing completion and will be available for distribution at an early date.

A detailed statement regarding the statistical and other work of the Tariff Commission is set forth in its Annual Report to Congress for 1939.

Bituminous Coal Division, Department of the Interior

The Division is requesting reports from producers of bituminous coal on the costs of production and the realization from the sale of the coal produced during the last seven months of 1939. Similar data were collected previously for the first five months of 1939.

In the final hearings on minimum prices for bituminous coal which have just been completed extensive use was made of the Division's statistical study of the entire commercial distribution of coal in the United States in 1937.

Bureau of Statistics, Interstate Commerce Commission

The Interstate Commerce Commission has required large steam railways to make a detailed analysis of waybills for freight delivered on selected days in 1939 taken as a test period, the data to be used in a comprehensive study of the class rate structure.

As a condition accompanying its approval of changes in express rates in 1939, the Interstate Commerce Commission required the American Express Agency to make a test period study of its traffic for the purpose of showing if possible the effect of the rate changes approved. It is expected that the number of shipments analyzed will be in the neighborhood of 2,000,000.

Dominion Bureau of Statistics, Canada

General. As part of Canada's War Effort, a classified compilation is being made of all research laboratories in Canada and the type of research being followed in each. It is expected that the results will be of great value to the

Government and to the War Supply Board in ascertaining what Canada's facilities in this respect are and where they are located.

Demography. The first two volumes (final) of the 1936 Census have appeared, both dealing with the Province of Manitoba. One covers the general aspects of population and agriculture and the other occupations, unemployment, earnings and employment, households and families.

Vital Statistics. In January, 1939, the compilation of statistics pertaining to Epidemiology for the provinces and certain cities and towns, which had been carried on in the Vital Statistics Branch of this Bureau since 1924, was continued in co-operation with the newly-created Division of Epidemiology of the Department of Pensions and National Health. A close liaison between the Bureau and the Department of Pensions and National Health now exists for the working up of these statistics.

The report of births and deaths, by places of residence, referred to in my previous report, is now available for distribution.

Mining Statistics. The Bureau, in co-operation with the Department of Mines and Resources, is making a survey of stocks of minerals on hand and on the probable future requirements of these materials.

Since the first of the year, the following surveys have been undertaken:

1. Sales of Scrap Metals by Canadian Dealers, 1939: sold to Canadian foundries, smelters, etc.; sold for export; stocks on hand on December 31, 1939; and price range, 1939.
2. Scrap Metals: stocks on hand, January 31, 1940, and quantity used during January, 1940.
3. Consumption of Chemicals in Municipal Waterworks in Canada, 1938 and 1939.

The results of these surveys are not yet available.

The Bureau has recently completed a survey of those machine shops in Canada which are chiefly engaged in custom or repair work, covering the year 1937. These shops have not been included in the 1937 or previous Censuses of Industry.

Trade Statistics. The classification of commodities in export statistics has been completely revised and will be made effective from January 1, 1940. At that time the present Quarterly Trade Report and Monthly Summary will be abolished and a new Monthly Report substituted therefor.

As from the first of September, 1939, statistics respecting the gross imports and exports of gold will not be published. However, the net non-monetary gold exports, including earmarked gold, will be appended to the regular trade reports as a footnote.

Judicial Statistics. In the 1939 report of Judicial and Criminal Statistics, a more detailed analysis of the ages of offenders will be given. At present, offenders over 20 years are classified into three age-groups, viz., 21–39, 40–59, and 60 and over. The new grouping will be 21–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50–59 and 60 and over.

Public Finance. In the December 1937 number of this JOURNAL, reference

was made to a Dominion-Provincial Conference on Municipal Statistics in Canada at which certain continuing-committees were appointed for the purpose of studying the possibilities of uniform reporting. After many consultations and revisions of suggested schedules, the reports of the several committees have been completed for discussion at a further conference which it was hoped will be called in May.

Nutrition and Family Living Expenditure. Five new bulletins have been issued, giving summary results of expenditure data for urban families and a sixth covering farm living and operation expenditures. The titles of the six bulletins are:

1. Wage-Earner Family and Expenditure Income.
2. Family Income per Person in Relation to Wage-Earner Family Living Expenditure.
3. Urban Wage-Earner Family Living Expenditures in Relation to Tenure and Housing Accommodation.
4. Family Composition in Relation to Wage-Earner Family Living Expenditures.
5. Canadian Urban Wage-Earner Family Purchases of Foods.
6. Canadian Farm Family Living Expenditures, 1938.

Social Analysis. Census Monograph No. 2, "The Age Distribution of the Canadian People" has just been completed and will be available in a short time. Such a study, based on the Census of 1931 and supplementary data as far back as 1861, presents an attempt to analyze age as a concrete whole. Comprising 100 pages, this monograph deals with four main topics (1) evolution of the Canadian age distribution from 1881–1931; (2) classification of areas by age types; (3) classification of areas by functional aspects of age distribution; and (4) classification of urban localities by peculiarities in age structure.

Dun & Bradstreet, Inc.

Municipal Tax Delinquency. The Municipal Department published in February its annual survey of Municipal Tax Delinquency, utilizing data gathered through the Company's various district offices. This survey, covering cities of over 50,000 in population, will show the trend of year-end delinquency on current tax levies from 1930 through 1939, total annual collections of current and delinquent taxes for five years through 1939, and the accumulation of delinquent taxes in the various cities at the close of the last fiscal year.

Studies of "Big Business." A series of articles by Edwin B. George, examining the available statistics and rhetoric on the subject, is currently appearing in *Dun's Review.* Evidence on the present degree of concentration was examined in the first article "How Big is Big Business?" (March 1939). The second, "Is Big Business Getting Bigger?" (May 1939), investigates the rate at which concentration is thought to have increased. Third in the series, "How Did Business Get Big?" (September 1939), analyzes the relative con-

tribution to concentration of financing and of merger, and the latest article in the series, "Profits and Dividends: Big Business vs. Small" (January 1940), contrasts Big Business' rate of earning and reinvestment with that of Small Business. Scheduled for early analysis are such subjects as motives for bigness and relative performance of large and small corporations from the viewpoint of public service.

Business Trend Survey. Over two million questionnaires were mailed out early in January and a preliminary tabulation of these January returns—about ten thousand in number—appears in the March issue of *Dun's Review.* Sales in 1939 and year-end inventories are estimated in total for the three broad fields of retailing, wholesaling and manufacturing, also separately for fifteen of the larger retail trades. A final report, planned for the May issue of *Dun's Review,* will utilize the large corporation returns which become available after the March 15th income tax deadline. Sales and inventory figures will be estimated separately for about one hundred lines of industry and trade.

It is not expected that this Survey will be repeated next year since the interest in inventory figures has developed rapidly and it is expected that the Department of Commerce monthly reporting now operative in wholesale trades will be extended shortly to the manufacturing and retailing fields.

National Bureau of Economic Research, Inc.

At the meetings of the American Statistical Association in Philadelphia the National Bureau displayed, among its other publications, three new books: *Studies in Income and Wealth, Volume Three, Textile Markets, Their Structure in Relation to Price Research, Price Research in the Steel and Petroleum Industries,* and page proofs of *Personal Finance Companies and Their Credit Practices.* The book, the first of the series of volumes on Consumer Instalment Financing, was issued in January.

The seven parts of the third volume of papers presented at the annual meetings of the Conference on Research in National Income and Wealth are by C. L. Merwin, Jr., Charles Stewart, Enid Baird and Selma Fine, R. W. Goldsmith with the assistance of Walter Salant, Clark Warburton, R. R. Nathan, and P. H. Wueller.

A report from one other of the committees of the Conference on Price Research—"Distributional Costs and Pricing Policies at Retail"—is being revised and edited. With the completion of these reports the work of the Price Conference turns in somewhat different directions. The Committee on Bituminous Coal Prices has become the Committee on Governmental Price Regulation. Waldo Fisher of the University of Pennsylvania, the Chairman, assisted by Charles M. James, a Carnegie Research Associate at the National Bureau, will direct a study of the experiment of the National Bituminous Coal Commission in regulating minimum prices of coal in the United States. Edward S. Mason of Harvard University is Chairman of the Committee on Cost-Price Relations and Price Determination. Assisted by John

T. Dunlop, also of Harvard University, he will direct a study of the role of cost in determining prices.

The Conference on Research in Fiscal Policy, under the chairmanship of W. Leonard Crum of Harvard University, plans to undertake two studies immediately: The Relation of Income as Determined for Tax Purposes to Income as Determined for other Purposes; Financing the Federal Debt with special emphasis upon the Effects upon the Banking System and the Money Market.

National Industrial Conference Board, Inc.

The Division of Industrial Economics of The Conference Board has recently completed and issued a study in book form entitled "Studies in Enterprise and Social Progress." It will shortly issue a book, in cooperation with Professor Myron W. Watkins of New York University, entitled "Public Regulation of Competitive Practices in Business Enterprise." The Division will shortly release in the *Conference Board Economic Record* the results of a questionnaire survey on "The Economic and Statistical Work of Business Corporations." In the *Economic Record* of December 16, 1939, the Division reported its initial seasonally adjusted series of monthly data on "Inventories and New Orders in Manufacturing, 1929–1939." The number of reports has been expanded since then; the data are continuously being given a broader basis of coverage.

Investigations of the Twentieth Century Fund

The study of Collective Bargaining, which is being conducted under the directorship of Dr. Harry A. Millis, is progressing rapidly and individual members of the staff have either already completed, or are about to complete the individual industry reports. It is hoped that all these will be in final revised form within two months and that the remaining parts of the report will be ready to go to the printer by next summer.

The study of economic effects of short selling on the New York Stock Exchange, conducted under the directorship of Dr. Frederick R. Macaulay, is not yet in final form, although a large part of the text has already been prepared. It is hoped that the findings will be ready for publication within the next few months.

The Fund's study of the relations between the government and the electric light and power industry is progressing rapidly under the directorship of Dr. Arthur R. Burns. Most of the field work has been completed, and some of the text has already been prepared in tentative form. It is hoped that the study will be completed during 1940.

The Fund Trustees have authorized a comprehensive study of housing in relation to employment in the United States and appropriated funds for the study. They have appointed the following committee to exercise general supervision over the work of the staff: Henry E. Hoagland, Mrs. Lillian M. Gilbreth, Dr. Frank P. Graham, Henry I. Harriman, Arthur C. Holden, John A. Lapp, Dr. William I. Myers, and Sir Raymond Unwin.

CHAPTER ACTIVITIES

The Albany Chapter

The Albany Chapter held a dinner meeting on November 29, 1939. Sixty-five members and guests attended.

Charles Armstrong, President of the Chapter, turned the meeting over to David M. Schneider, the Vice-President, who introduced Ewan Clague, Director of Research and Statistics of the Social Security Board. Mr. Clague gave a very interesting talk on "Research Problems Faced by the Social Security Board," in connection with revision or extension of plans for old age insurance, benefits to widows and children, disability insurance, and unemployment compensation. The need for cooperation in research work, the importance of clear, simple writing, and the value of graphs in presenting data were emphasized.

Meredith B. Givens, of the Division of Placement and Unemployment Insurance of the State Department of Labor, was called upon for remarks, which were followed by questions and discussion from the floor. The meeting closed with an expression of appreciation to the speaker.

The Austin Chapter

The Austin Chapter met for luncheon on December 18, 1939. Principal speaker at the meeting was Nathanael H. Engle, Assistant Director of the Bureau of Foriegn and Domestic Commerce, U. S. Department of Commerce. The Chairman of the Austin Chapter, C. W. Vickery, presided. Dr. Engle spoke informally about the research work of his Bureau. He referred to the increasing interest of the Bureau in problems affecting domestic commerce and the need for closer cooperation with state bureaus of business research. W. R. Woolrich, Dean of the College of Engineering, and E. P. Schoch, Director of the Bureau of Industrial Chemistry, who were guests at the meeting, spoke briefly on the research work in which they are engaged and its industrial and economic implications. The last half hour of the meeting was devoted to open discussion.

The Chicago Chapter

Harold C. Taylor, Chief of the Psychological Research Section, Hawthorne Works, Western Electric Company, discussed "The Applications of Statistics in Personnel Research" at a meeting of the Chapter on November 28.

A joint meeting of the Chapter and the Chicago Chapter of the American Marketing Association was held on January 9. The general topic for the meeting was "The Stamp Plan—A National Experiment in Distributing Surplus Foods." Milo Randolph Perkins, President of the Federal Surplus Commodities Corporation and Associate Administrator of the Agricultural Adjustment Administration, was the principal speaker with the discussion

led by Melchior Palyi, Economist of the Stifel, Nicolaus and Company, and George Lewis, Director, Institute of Meat Packing, University of Chicago, and Director of the Department of Marketing of the Institute of American Meat Packers, Chicago.

The Cincinnati Chapter

The second fall meeting of the Cincinnati Chapter was held on December 7. Gerald V. Lannholm of the Teachers College of the University of Cincinnati presented a paper on "Some Recent Developments in the Application of Statistics to Educational Research." Dr. Lannholm discussed the possibilities of variance and co-variance analysis as developed by R. A. Fisher. By the use of illustrative data, he compared the conclusions as obtained by the newer techniques with those obtained by the older methods. He also emphasized the change in the concept of the estimate of error by the Fisher method. Dr. Lannholm also stated that the newer techniques would have a considerable influence upon the design of experiments in educational research.

The first part of the meeting of the Cincinnati Chapter held on February 1, 1940, was an open discussion of the *Journal* led by F. E. Wolfe, who had attended the meeting of the District Representatives at the Philadelphia meeting.

Following the discussion, Edgar Z. Palmer, of the Bureau of Business Research, University of Kentucky, discussed the "Measurement of Income on a Local, State, and Regional Basis." He first made a distinction between "source" statisticians and "method" statisticians. He then made the assertion that the difficulties involved in the measurement of income on a less than national basis arose because of the confusion in the concepts of income. Dr. Palmer classified and explained the following four types of income: (1) production (measured in physical terms), (2) consumption, (3) money receipts, and (4) accruals. These concepts are independent of each other and cannot be combined without resulting in conflicting points of view. As to the statistical approach, Dr. Palmer asserted that the Index method using indexes based on the number of taxpayers, telephone listing, or other measures was unsatisfactory because such indexes were insensitive to low income groups. He advocated in its place the "Build-up" method in which income estimates were the aggregates of incomes of individuals in small regional areas. Such estimates could be based on (1) state income tax returns, (2) farm census data, and (3) Social Security data.

The Cleveland Chapter

The Business Statistics Section met on December 6 to hear J. W. Vanden Bosch of the Cleveland Chamber of Commerce discuss his method of making pre-census estimates of employment, payrolls, and value of products for the Cleveland industrial area. Each month, the Chamber collects employment

data from 100 representative Cleveland concerns. The high correlation of these data with that of the Census of Manufactures enables him to forecast the Census of Manufactures data with a small amount of error months before the Census Bureau releases its figures.

On January 9, Raymond T. Cragin, one of Cleveland's leading realtors and President of the Real Property Inventory, addressed the group on the subject, "Who Will Buy New Houses?" As is the case with automobiles, Mr. Cragin stated that the people in the lower income brackets buy their houses second-hand. New building has always come from the middle and upper income groups. Mr. Cragin expects building activity to increase over the longer term due to the increase in families and the decline in the number of building units available. New units constructed during the depression failed even to make up losses from fire and demolition.

The Columbus Chapter

The second regular meeting of the Columbus Chapter was held on November 15, 1939, at which time William Papier, Statistician for the Ohio Bureau of Unemployment Compensation, discussed "Statistics of Unemployment Compensation in Ohio." He presented a number of charts and tables and distributed examples of the kinds of reports which are regularly compiled by his organization. He also discussed the kinds of studies that were in process.

The third regular meeting was held on January 17, 1940. John Sloan, Statistician for the State Department of Social Welfare, and William Mautz, Statistician for W.P.A. in Ohio, presented statistical problems involved in the evaluation of the relief problem in the State. Each of these men presented samples of the work which they regularly publish and distribute, and pointed out weaknesses in the data which make interpretation difficult.

The Connecticut Chapter

A joint meeting of the Chapter and the Connecticut Control of the Controllers Institute was held on January 3. E. C. Wilkinson, of the Standards Statistics Company, Inc., spoke on "Business Outlook for 1940."

The Harrisburg Chapter

Two temporary committees were appointed by the president of the local chapter recently. A Nominating Committee comprised of four persons drew up a report recommending the names of several active members for election as officers of the Chapter for the ensuing year. Miss Florence Hardy, Chairman, presented this report at the regular monthly meeting in December. Formal election of officers was conducted at this time with the reelection of Emmett H. Welch and John W. Mitchell as President and Secretary-Treasurer, respectively, while L. Z. Holcombe was newly elected Vice-President and Helen F. Eckerson, Corresponding Secretary. A "Sustaining Fund" Committee was established upon the recommendation of the national

secretary in connection with the Centenary Celebration of the American Statistical Association. It functioned temporarily for the purpose of conducting the drive for membership and for funds locally. As a result, there was a substantial increase in regular members of the Association. About ten Harrisburg members attended the Annual Meeting at Philadelphia in December.

Recent programs have represented a continuation of the State Statistics Series inaugurated last spring by this Chapter. On November 21 the topic was Public Assistance statistics—members of the Research and Statistics staff of the State Department of Public Assistance discussed the nature and scope of such data, development and organization of the statistical research program, reporting and analytical procedures, and the results of various studies on general relief, assistance, and unemployment. A similar program was presented on January 16 by members of the Research and Statistics Section, Bureau of Employment and Unemployment Compensation, State Department of Labor and Industry. A round table discussion was conducted on the statistical aspects of employment service and unemployment compensation in Pennsylvania with particular emphasis on organization, reporting procedures, and research problems. Two motion pictures featuring phases of this work in Pennsylvania were shown.

Dr. Richard O. Lang, of the Population Division, Bureau of the Census, U. S. Department of Commerce, spoke at the regular monthly meeting on December 12. His topic was "The 1940 Census of Population," outlined under four broad phases: (1) differences from preceding censuses in content and coverage of the schedule, (2) information from sample census, (3) data formerly gathered but discontinued, and (4) contemplated housing survey. Following the formal lecture, the meeting was turned into an open discussion during which period numerous problems on detailed factors involved in the census enumeration were clarified for the benefit of local statisticians.

At this meeting John W. Mitchell, District Representative of the American Statistical Association, spoke briefly concerning national activities and objectives of the Association and extended an invitation to local statisticians to join the Association and to attend the forthcoming annual meetings of the Allied Social Science Associations.

The New York District Chapter

"Investments in War Time" was the general topic for the meeting of the Chapter on January 23. F. Leslie Hayford, of the General Motors Corporation, presided.

The first speaker was James Hughes of Smith, Barney and Company. He recalled his major thesis, advanced in previous addresses, that ordinarily the American banking system could not finance both a bull market and business at the same time. Prior to the establishment of the central reserve system most of the bull markets took place while business was below normal; most of the bear markets while business was above normal. During the Twenties we had both bull market and prosperity at the same time. The

stock market was whirled to such heights that when the 1929–32 business collapse took place, the business decline had perforce to be accompanied by a stock decline, each movement sustaining and propelling the other. The 1928–29 speculative boom was not the product of any new techniques of manipulation, but of the new flood of credit made available by the Federal Reserve System. The speculative boom and collapse brought on the Federal securities regulation. This was aimed at speculation without any attention being paid to the banking inflation that alone made the debauch possible.

A second ironic twist in the financial policy of the Administration is the adoption of deficit financing by bank credit, a direct face-about from Roosevelt's Pittsburgh speech in the 1932 campaign.

A third ironic development was the New Deal 1936–37 boom control. Here was the government, the only agency that had been expanding bank credit (to the tune of some 9 billion) making civil war on itself by raising reserve requirements and other devices to "stop the dangerous inflation." This inflation-anti-inflation campaign produced the worst liquidation of government bonds in history.

Why did not the stock market follow the production rise in the last quarter of 1939? Investment trusts and investment counsellors now all think more or less alike. They stampede into the market, and stampede out, more or less at the same time. Thus when they have finished buying, there is no one left to buy, and so the market stops. No longer are there pools and manipulators to keep the markets going, and no longer can investment bankers float new security issues, for successful flotations depend on slowly and continuously rising markets. Easy money no longer produces bull markets and corporate financing; this step, this necessary step, in the flow of money to activate the economic machine, has been legislated out.

As a final ironic twist, in the financial history of the last few years, be it noted that during the last hundred years no political party has been returned to power after a depression has occurred, and when, at the time of election, stock prices remain more than 20 per cent below a recent peak. This year's election occurs after the 1938 depression which was in part an outgrowth of the Administration's policies, including the civil war of the reserve requirements, and to the probable accompaniment of stock prices well below the 1937 peak, perhaps around the 130 level on the Dow Jones. This stock market performance is, as we have seen, due to the normal behavior of the stock market having been legislated out of existence. It remains to be seen whether history will repeat itself by the November elections bringing about a change of administration.

"Capitalization of Earnings During War Time" was discussed by Glenn G. Munn, of Paine, Webber and Company, and John H. Lewis, of Goodbody and Company. War is the paramount factor to be taken into account in valuing equities at the present time. The United States may become engaged, and the investor must base action on the possibility of war taxes and dictatorship. At present price-earnings ratios are the lowest in several

years; thus reappears a phenomenon of the last war. Analysis of the price and earnings records of 110 companies during the last war show that the additional earnings during the war period were not capitalized as a rule beyond 1 to 4 times; that is, each dollar of additional earnings raised stock prices 1 to 4 dollars, with of course many individual deviations. The experience suggests that a multiplier of 3 may be used under present conditions. On this basis aircraft shares, for instance, are not cheap at present prices.

Thomas Phelps, of E. I. du Pont de Nemours and Company, spoke on "The Dow Theory in War Time." There are misunderstandings about the Dow theory. It is a simple application of the general rule that, when in doubt, count on the continuance of what is; long-term trends persist. Weighing economic, psychological, and political pros and cons is too difficult; clean-cut decisions are impossible; there are too many variables. So as a practical matter we can fall back upon the Dow theory. The Dow theory is especially valuable in war time because conditions are so complex. It worked during the last war. At the present time bear arguments from the action of the market are not cogent, and the evidence favors the view that we are still in a bull market.

Benjamin Graham spoke on "Common Stock Investment Today." He declared that investment and speculation should not be confused; there is a sound and useful distinction between the two. He indicted investment trusts and counsel in general of speculating under the guise of investment, and pointed to the mediocre showing of the five largest investment trusts. Why this mediocre showing? It is not a question of ability, because these trusts have the best Wall Street brains on their research staffs. The trouble is that investment trusts try to combine market analysis with security analysis. Trading operations are not investment, and the two cannot be combined.

An idea allied to market analysis is the policy of selecting the so-called growth companies as against the cyclical companies. This theory requires holding certain "growth stocks" (such as chemicals) over several cycles. The theory is valueless because Wall Street cannot predict the long-term trends necessary for the utilization of this approach. Wall Street almost always projects a *past* trend at the moment when it is about to change; it can't foresee changes in these trends.

Another mistake is that little attention is paid to price. Wall Street usually pays too high a price even when it is right on the direction of trends. The idea is held that price is a minor consideration in these favored situations. A recent book on the ebb and flow of investment values disregards price almost entirely. As an example of the extremes to which Wall Street will go, Mr. Graham cited Atlantic and Pacific Tea Company, which as one of the favored growth companies of 1929, sold as high as $400 a share, but which in March, 1938, sold at $36 a share for less than the net quick assets of the company.

These examples show that there is a proper role for investment. There is a place for hard-boiled investors. There must be someone to buy stock from the speculators who want to sell at low prices, and to sell to them at high prices. There is a sound distinction between investment and speculation. The following five rules are offered as guides to investment policy.

(1) The investor should take the same attitude in buying stocks that he would in buying into a business, and apply the same criteria.

(2) He should pay attention to price, and buy only when the stock is cheap.

(3) While future prospects are important, he should not purchase predominantly on the basis of future prospects.

(4) The investor should be ready to buy companies with a neutral outlook if the price is right. There is no justification for the widespread feeling that small companies are unprofitable. With reference to the idea that we need overvalued markets to permit successful common stock flotations, the trouble is that Wall Street's attitude is wrong.

(5) The investor should be ready to buy the general market when the market level is low by objective standards. He should never mind the "signals."

The separation of investors and speculators should be very healthful, and should facilitate the raising of capital.

VICTOR VON SZELISKI

The Philadelphia Chapter

The Executive Committee of the Philadelphia Chapter met early last fall and outlined a series of topics for discussion during the ensuing year which were felt to be most timely and basic under existing economic conditions.

The first of these topics centered around the problem of the productivity and income of labor in the United States and was discussed at a meeting of the Chapter November 17, 1939. Harry Magdoff, Statistician for the National Research Project and supervisor of a recent three-volume study of *Production, Employment and Productivity in 59 Manufacturing Industries*, addressed the group on the subject "The Changing Productivity of Labor in the United States." He traced the rapid growth in output per man and per man-hour in manufacturing, mining, and agriculture from 1919 through 1936 and outlined in a general way some of the methods employed in analysis. R. R. Williams, Statistician of the Federal Reserve Bank of Philadelphia, discussed the subject "Some Aspects of Labor Income." He presented data showing the trend of hourly, weekly, and annual earnings and of real income, and suggested possible relationships among hourly earnings, employment, total income, and prices. Trends were analyzed briefly in terms of such contributing factors as legislation and labor organization. A brief statistical appraisal of the underlying data was also presented.

The second meeting of the Philadelphia Chapter was held December 15 on the general subject of the collection of current economic statistics. Stuart

A. Rice, Chairman of the Central Statistical Board and professor at the University of Pennsylvania, discussed "The Coordination of Current Economic Statistics," outlining the function and achievements of the Central Statistical Board and illustrating the problems that arise in connection with the coordination of statistics owing to the diversity of organizations and functions in the field. Simon Kuznets, member of the staff of the National Bureau of Economic Research and professor at the University of Pennsylvania, spoke on the subject "Factors Determining the Supply of Economic Statistics." He reviewed briefly in this connection the origin of statistics as a method of measurement and gave a resume of outstanding developments in the history of economic statistics. He emphasized particularly the relationship between the availability of statistical data and the existence and importance of prevailing socio-economic problems. He also discussed certain influences in the business system which restricted or stimulated the supply of information.

The third meeting of the Philadelphia Chapter in the current academic year was held January 26, 1940, at which time Robert R. Nathan, Chief of the Division of National Income, Bureau of Foreign and Domestic Commerce, and John L. Martin, of the same Division, spoke on the subject "Developments in the Field of National Income." Mr. Nathan discussed the concept of national income and stressed the fact that it represents the most comprehensive measure of general economic activity. He outlined and distinguished between the different approaches to and phases of the subject, such as the character of national income produced as compared with national income payments to individuals; the subdivisions of national income payments, including employees' compensation, business withdrawals, rents and royalties, and dividends and interest; and the approaches to estimates of income by industrial sources and by geographic regions. He traced the flow of real income and money income, discussed the relationship between money and real income, and outlined prospective developments in this field of study. Mr. Martin spoke in greater detail on the methods of estimating income and the sources of available information, including a brief appraisal of the sources and of some of the difficulties encountered. He stressed the point that estimates are built up from comprehensive study and analysis of small sections of the total economic activity.

The San Francisco Chapter

At a meeting of the San Francisco Chapter on October 26, 1939, Holbrook Working of the Food Research Institute discussed "European Developments and Commodity Prices." Discarding certain popular and over simplified theories of the factors that affect commodity prices, Dr. Working reviewed the history of prices in the last European war and pointed out examples of different sets of forces that were at work and that might be considered as possible important influences in the present war.

Robert F. Martin, Lecturer in Business Economics in the Graduate

School of Business, Stanford University, spoke before the Chapter on December 7, 1939, on "National Income; Estimates and Their Uses." At this meeting the following officers were elected for 1940: President, V. P. Timoshenko, Food Research Institute; Vice-President, Howard S. Ellis, University of California; Secretary-Treasurer, William A. Sturm, California State Chamber of Commerce; elected members of the Executive Committee, D. R. Fuller, North American Investment Corporation, and M. R. Benedict, Giannini Foundation.

At a meeting of the Chapter on February 1, 1940, J. B. Condliffe, Professor of Economics at the University of California, discussed "The Mechanism of the Balance of Payments."

The Washington Statistical Society

A meeting of the Washington Chapter was held on November 14, 1939, under the chairmanship of Carroll B. Reece, Member of Congress. "Present Day Price Problems" was the subject under discussion. Talks were given by Don D. Humphrey, Department of Commerce, on "Price Dislocation and Investment Policy"; Corwin Edwards, Department of Justice, on "Boundaries of Price Control Under Existing Law"; and Saul Nelson of the Bureau of Labor Statistics on "Price Competition at Retail."

An interesting and instructive meeting was held on December 7, 1939, with Calvert L. Dedrick of the Bureau of the Census acting as chairman.

The subject of the evening was "Statistics in Special Research," and talks were given by Oswald Nielsen, Department of Agriculture, on "Actuarial and Statistical Aspects of Crop Insurance"; Donald S. Thompson, Chief, Division of Research and Statistics, Federal Deposit Insurance Corporation, on "Actuarial and Statistical Foundation of Bank Deposit Insurance;" and Meyer A. Girshick of the Bureau of Home Economics, Department of Agriculture, on "Statistical Problems Involved in Sizing Children's Garments and Patterns."

"Statistical Aspects of the Reapportionment of the House of Representatives" was the subject chosen by Walter F. Willcox, Professor Emeritus of Cornell University, when he addressed the Washington Chapter at the regular meeting on January 18, 1940. Professor Willcox is an outstanding authority on this subject and a former President of the Association. Meyer Jacobstein, former Member of Congress and now at Brookings Institution, acted as chairman of the meeting. A general discussion followed the address by Professor Willcox.

NEW MEMBERS

A Centenary Membership Directory will be published as a supplement to the next issue of this JOURNAL. Beginning with this issue of the JOURNAL the publication of a list of new members will be discontinued. In place of the quarterly lists it is planned to issue in the future annual lists of new members to serve as supplements to the most recent membership directory.

PROCEEDINGS

101st Annual Meeting

BELLEVUE-STRATFORD HOTEL, PHILADELPHIA

PROGRAM

Wednesday, December 27, 1939

—10:00 A.M.—

STATISTICAL STUDIES OF BUSINESS CYCLES
Chairman: Irving Fisher, Yale University
Turning Points in Business Cycles
Leonard P. Ayres, The Cleveland Trust Company
Evidence as to the Causes of Business Fluctuations
Joseph A. Schumpeter, Harvard University
A Measure of Purchasing Power Inflation and Deflation
Murray Shields, The Irving Trust Company
Discussion: M. Joseph Meehan, U. S. Bureau of Foreign and Domestic Commerce
Alexander Sachs, Lehman Corporation

ROUND TABLE ON TEACHING BUSINESS STATISTICS
Chairman: John R. Stockton, University of Texas
Discussion: John R. Stockton, University of Texas
W. A. Neiswanger, University of Illinois
Dudley J. Cowden, University of North Carolina

CONTRIBUTED PAPERS
(Arranged by the Biometrics Section)
Chairman: Raymond Pearl, The Johns Hopkins University
Statistical Test of Significance for Weekly Mortality Rates
Thomas J. Duffield, Marie Di Mario and Irving Galloway, New York City Department of Health
An Application of the Two-Stage Catalytic Curve in Epidemiology
Hugo Muench, Rockefeller Foundation
Some Statistics Involved in the Counting of Bacteria by the Dilution Method
H. O. Halvorson and Alice Moeglein, University of Minnesota
Statistical Weights for Prognostic Factors of the Insulin Treatment of Schizophrenic Patients
E. M. Jellinek, Research Council Project on Problems of Alcohol

Wednesday, December 27, 1939

—10:00 A.M.—

CENSUS TRACT CONFERENCE
(Committee on Census Enumeration Areas)
Chairman: Howard Whipple Green, Cleveland Health Council
The 1940 Census Tract Cities
C. E. Batschelet, U. S. Bureau of the Census
The 1940 Census Schedule
Vergil D. Reed, U. S. Bureau of the Census
Housing Data Schedule for 1940 Census
Ernest M. Fisher, Federal Housing Administration
Data by Census Tracts—Table Forms
Leon E. Truesdell, U. S. Bureau of the Census
An Economic Index for Census Tracts of Cincinnati
Douglas E. Scates, Duke University

—12:30 P.M.—

LUNCHEON MEETING, CENSUS TRACT CONFERENCE
(Committee on Census Enumeration Areas)
Chairman: Howard Whipple Green, Cleveland Health Council

—2:30 P.M.—

LAG EFFECTS IN STATISTICS AND ECONOMICS
(With the Institute of Mathematical Statistics)
Chairman: J. D. Tamarkin, Brown University
Lag Effects in Statistics and Related Problems
A. J. Lotka, Metropolitan Life Insurance Company
Some Methods in the Analysis of Lag Effects
H. T. Davis, Northwestern University
Lag Effects in Economics
Charles F. Roos, Institute of Applied Econometrics, Inc.

ROLE OF CONSUMER FINANCING IN ECONOMIC ORGANIZATION
(With the Advisory Conference on Research in Finance and the Econometric Society)
Chairman: W. F. Kurtz, The Pennsylvania Company
Pattern of Consumer Instalment Debt
Rolf Nugent, Russell Sage Foundation
Risk Elements in Consumer Instalment Financing
David Durand, National Bureau of Economic Research
Consumer Financing and Economic Fluctuations
Gottfried Haberler, Harvard University
Discussion: Malcolm L. Merriam, U. S. Bureau of Foreign and Domestic Commerce
Milan V. Ayres, National Association of Sales Finance Companies

Wednesday, December 27, 1939

—2:30 P.M.—

ROUND TABLE ON CLASSIFICATION OF HOSPITAL MORBIDITY
Chairman: Edwin L. Crosby, M.D., The Johns Hopkins Hospital
Discussion: Joseph Berkson, M.D., Mayo Clinic
Marta Fraenkel, M.D., Welfare Council of New York City
A. Hardisty Sellers, M.D., Department of Health for Ontario
Selwyn D. Collins, U. S. Public Health Service

—3:00 P.M.—

STATISTICS OF FAMILY COMPOSITION AND TYPE OF HOUSEHOLD
(With the American Sociological Society)
Chairman: Richard O. Lang, U. S. Bureau of the Census
Statistics of Family Composition Needed for the Social Security Program
Barkev Sanders, Social Security Board
Statistics of Families in the 1940 Census
Leon E. Truesdell, U. S. Bureau of the Census
Discussion: Charles P. Loomis, U. S. Bureau of Agricultural Economics
Willard Waller, Barnard College
Frank Lorimer, American University

—8:00 P.M.—

DESIGN AND ANALYSIS OF REPLICATED EXPERIMENTS
(Biometrics Section with the Institute of Mathematical Statistics)
Chairman: George W. Snedecor, Iowa State College
Practical Difficulties Met in the Use of Experimental Designs
A. E. Brandt, U. S. Soil Conservation Service
Factorial Design and Covariance in the Biological Assay of Vitamin D
C. I. Bliss, Sandusky, Ohio
Combinatorial Problems in the Design of Experiments
Gertrude M. Cox, Iowa State College
Experimental Trials with Balanced Incomplete Blocks
W. J. Youden, Boyce Thompson Institute for Plant Research

Thursday, December 28, 1939

—10:00 A.M.—

STATISTICAL STUDIES IN BANKING AND INVESTMENT
Chairman: W. J. Carson, University of Pennsylvania
Bank Holdings of Government Securities and the Problem of Excess Reserves
Lawrence H. Seltzer, Wayne University
Corporate Earnings in Durable Goods Industries in Prosperity and Depression
Francis McIntyre, Stanford University and Cowles Commission for Research in Economics
A Factor Analysis of Stock Prices
Alvin Mayne, University of Illinois

Thursday, December 28, 1939

—10:00 A.M.—

STATISTICS IN RELATION TO INSURANCE
(With the Biometrics Section)
Chairman: Alfred J. Lotka, Metropolitan Life Insurance Company
Actuarial Problems in Social Insurance
R. A. Hohaus, Metropolitan Life Insurance Company
Mortality Tables—Financial Measuring Rods in Life Insurance
A. N. Guertin, New Jersey Bureau of Insurance
Misinterpretation of Mortality Statistics
W. A. Jenkins, Teachers Insurance and Annuity Association
Statistical Methods as Applied to Casualty Insurance
Mark Kormes, New York State Insurance Fund

ROUND TABLE CONFERENCE: THE ANNUAL PRISON REPORT
(Arranged by the Committee on Statistics of Delinquents and Criminals)
Chairman: Thorsten Sellin, University of Pennsylvania
The Medical Work
Ellen C. Potter, M.D., New Jersey Department of Institutions and Agencies
The Disciplinary Phase
Ray Huff, General Superintendent, District of Columbia Penal Institutions
The Educational Work
Glenn M. Kendall, New York State Department of Correction

PROBLEMS OF BUILDING COSTS
Chairman: Seymour L. Andrew, American Telephone and Telegraph Company
The Costs of Building Materials
Wilson Compton, National Lumber Manufacturers Association
The Cost Elements of Housing
Peter A. Stone, Works Projects Administration
Relation of Building Costs, Industry, and Employment
David L. Wickens, National Bureau of Economic Research

PRESERVING COMPETITION VERSUS REGULATING MONOPOLY
(With the American Economic Association and the American Farm Economic Association)
Chairman: Edward S. Mason, Harvard University
Can Anti-Trust Policy Preserve Competition?
Corwin D. Edwards, U. S. Department of Justice
In What Areas Should Anti-Trust Policy Be Replaced?
Paul T. Homan, Cornell University
What Kinds of Public Control Are Applicable in These Areas?
Donald H. Wallace, Williams College

Thursday, December 28, 1939

—2:30 P.M.—

FINANCING AND MARKETING OF RESIDENTIAL BUILDING

Chairman: Bradford B. Smith, United States Steel Corporation

The Marketing Process for Residential Building

H. U. Nelson, National Association of Real Estate Boards

Financing Residential Construction: From the Point of View of Insurance Companies

William A. Berridge, Metropolitan Life Insurance Company

Financing Residential Construction: From the Point of View of Government Agencies

Ernest M. Fisher, Federal Housing Administration

Integration of the Housing Function

Thomas S. Holden, F. W. Dodge Corporation

ROUND TABLE ON PROBLEMS AND PROGRESS IN STATE STATISTICS

Chairman: Meredith B. Givens, New York State Department of Labor

Discussion: R. L. Gillett, New York State Department of Agriculture and Markets

Emmett H. Welch, Pennsylvania Department of Public Assistance

Roswell F. Phelps, Massachusetts Department of Labor and Industries

Edward W. Morehouse, Public Service Commission of Wisconsin

H. Daniel Darling, Connecticut Department of Labor and Factory Inspection

W. H. Mautz, State Statistician for Ohio, Work Projects Administration

RADIATION EXPERIMENTS

(Arranged by the Biometrics Section)

Chairman: C. P. Winsor, Iowa State College

Problems Arising in Irradiation of Genes, Viruses and Bacteria

J. W. Gowen, Iowa State College

Physical Aspects of Radiation Experiments

Frank M. Exner, Institute of Cancer Research

Poisson Distributions

Roger Wilkinson, Bell Telephone Laboratories

Radiation of Aspergillus Spores with Slow Electrons

C. P. Haskins and C. E. Buckwald, Union College

Biological Responses to Radiation

Francis C. Wood, Institute of Cancer Research

Thursday, December 28, 1939

—2:30 P.M.—

PRESERVING COMPETITION VERSUS REGULATING MONOPOLY
(With the American Economic Association and the American Farm Economic Association)
Chairman: Edward S. Mason, Harvard University
Discussion of papers of morning session:
Jerome Frank, Securities and Exchange Commission
Leon Henderson, Securities and Exchange Commission
Melvin de Chazeau, University of Virginia
Milton Katz, Harvard University
Saul Nelson, U. S. Bureau of Labor Statistics

—8:00 P.M.—

CONTRIBUTED PAPERS
(Arranged by the Biometrics Section)
Chairman: C. I. Bliss, Sandusky, Ohio
Interpretation and Computation of the Intrinsic Rate of Natural Increase and the Intrinsic Birth Rate
Morris H. Hansen, U. S. Bureau of the Census
The Age and Order of Birth Factors in Maternal Mortality
Jacob Yerushalmy, U. S. Public Health Service, and Morton Kramer, New York State Department of Health
An Evaluation of the Accuracy of Statements of Age on Census Records Obtained Through Follow-Up Procedures
Paul M. Densen, Vanderbilt University
Variation in the Length of the Cardiac Cycle in the Individual
Antonio Ciocco and Bert R. Boone, U. S. Public Health Service, and Joseph F. Kish, The John Hopkins University

Annual Business Meeting of the Biometrics Section of the American Statistical Association

PUBLIC SENTIMENT AND POPULATION STUDY
(With the Population Association of America)
Chairman: Leon E. Truesdell, U. S. Bureau of the Census
Sampling Public Opinion
Elmo Roper, New York City
Methods of Influencing Public Opinion
Hadley Cantril, Princeton University
Some Relations of War to Population Study
Herbert H. Marks, Metropolitan Life Insurance Company

Friday, December 29, 1939

—9:00 A.M.—

ANNUAL BUSINESS MEETING. Reports and Election of Officers

—10:00 A.M.—

UNEMPLOYMENT COMPENSATION CONTRIBUTIONS, BENEFITS AND RESERVES
Chairman: C. A. Kulp, University of Pennsylvania
The Problem of Increasing Reserves in Unemployment Compensation
Louis Levine, Social Security Board
Adequacy of Benefit Payments in a Highly Industrialized Area
Paul L. Stanchfield, Michigan Unemployment Compensation Commission
Adequacy of Benefit Payments in a Semi-Industrialized Area
E. J. Eberling, Tennessee Unemployment Compensation Division
Experience Rating and Unemployment Compensation Reserves
Thomas J. Mills, Connecticut Unemployment Compensation Division
Discussion: J. S. Gould, Delaware Unemployment Compensation Commission
Meredith B. Givens, New York State Department of Labor
Robert R. Nathan, U. S. Bureau of Foreign and Domestic Commerce

HEALTH SECURITY PROGRESS
(With the American Association for Labor Legislation)
Chairman: Edwin E. Witte, University of Wisconsin
Latest Proposals for a National Health Program
James E. Murray, U. S. Senator from Montana
Essential Statistics for a National Health Program
Isidore S. Falk, Social Security Board
Discussion: Robert F. Wagner, Jr., Member of New York State Assembly
Michael M. Davis, Committee on Research in Medical Economics
John D. Kingsbury, Author of *Health in Handcuffs*
George St. J. Perrott, U. S. Public Health Service

DEPARTMENTAL DISCUSSION OF THE USES OF THE CENSUS OF BUSINESS
(With the American Marketing Association)
Chairman: Paul T. Cherington, McKinsey & Company
Merchandising the Census of Business
Vergil D. Reed, U. S. Bureau of the Census
Use of the Census of Business by Retailers
Carl Dipman, Editor, *The Progressive Grocer*
Use of the Census of Business by Wholesalers
Alfred Byers, National Electrical Wholesalers' Association
Use of the Census of Business by Manufacturers with Direct Selling Problems
Frank Surface, Standard Oil Company of New Jersey
Use of the Census of Business by Manufacturers Selling Through Wholesalers
Victor H. Pelz, General Foods Corporation
Use of the Census of Business by Trade Associations
Hector Lazo, Cooperative Food Distributors of America
Use of the Census of Business by Advertising and Research People and Publishers
P. V. Jesters, A. C. Nielsen Company
Use of the Census of Business by Teachers of Marketing and Kindred Subjects
D. M. Phelps, University of Michigan

Friday, December 29, 1939

—10:00 A.M.—

PROBLEMS OF LOW INTEREST RATES

Chairman: M. Albert Linton, Provident Mutual Life Insurance Company

Measuring the Forces which Govern Interest Rates

Stephen M. Foster, City Bank-Farmers Trust Company

Low Interest Rates and Financial Institutions

William A. Berridge, Metropolitan Life Insurance Company

Defunctionalization Supervening Upon Easy Money Rates and the Frustration of Recovery

Alexander Sachs, Lehman Corporation

Discussion: Frederick Dirks, Board of Governors of the Federal Reserve System

Robert Warren, The Institute for Advanced Study

—10:30 A.M.—

STATISTICAL TECHNIQUES AND ECONOMIC THEORY

(With the American Farm Economic Association)

Chairman: O. C. Stine, U. S. Department of Agriculture

The Statistical Analysis of Economic Time Series

Gerhard Tintner, Iowa State College

Re-examination of the Derivation of Supply and Demand Functions in View of Recent Theoretical Developments

E. J. Working, University of Illinois

—2:30 P.M.—

CENTENARY CELEBRATION PROGRAM. TRENDS IN STATISTICS AND THE OPPORTUNITIES OF THE AMERICAN STATISTICAL ASSOCIATION

Chairman: E. Dana Durand, U. S. Tariff Commission

Census—Past and Future

Halbert L. Dunn, M.D., U. S. Bureau of the Census

Recent Statistical Trends

William F. Ogburn, University of Chicago

The Next 100 Years of the American Statistical Association

Joseph S. Davis, Food Research Institute, Stanford University

—7:00 P.M.—

CENTENARY CELEBRATION DINNER

Presiding Officer: F. Leslie Hayford, General Motors Corporation

Greetings of the Allied Social Science Associations

Jacob Viner, University of Chicago, President of the American Economic Association

Greetings of the Royal Statistical Society and the Canadian Political Science Association

R. H. Coats, Dominion Bureau of Statistics

Presidential Address: The Aging of Populations

Raymond Pearl, The Johns Hopkins University, President of the American Statistical Association

Saturday, December 30, 1939

—10:00 A.M.—

CONTRIBUTED PAPERS

Chairman: Frederick F. Stephan, American Statistical Association

Interpolation Formulae for the Adjustment of Index Numbers
V. L. Bassie, U. S. Bureau of Foreign and Domestic Commerce

Speed Statistics
Donald E. Church, Ohio University

Testing the Accuracy of Statistical Data
Pope R. Hill, University of Georgia

Discussion: Sidney W. Wilcox, U. S. Bureau of Labor Statistics

EMPLOYMENT, WAGES AND THE COST OF LIVING

Chairman: Ewan Clague, Social Security Board

Extent and Causes of Differences in Hourly Earnings
Jacob Perlman, U. S. Bureau of Labor Statistics

Changes in Employment as Related to Minimum Wages
A. F. Hinrichs, U. S. Bureau of Labor Statistics

Factors to be Considered in Measuring Inter-City Differences in Living Costs
Faith M. Williams, U. S. Bureau of Labor Statistics

Appraisal of Cost of Living Comparisons in the Light of Modern Theory
Hans Staehle, Harvard University

PROBLEMS OF STRUCTURAL ORGANIZATION OF BANKING AND PROPOSALS FOR IMPROVEMENT

Chairman: C. A. Sienkiewicz, Federal Reserve Bank of Philadelphia

Structural Organization of American Banking and Recent Changes: Statistical Analysis
Melchior Palyi of Stifel, Nicolaus & Company

Problems of Improving Banking Structure
Leonard L. Watkins, University of Michigan

Discussion: D. W. Michener, Chase National Bank

EFFECTS OF THE WAR ON AMERICAN BUSINESS

Chairman: Robert W. Burgess, Western Electric Company

The Steel Industry
Robert R. Williams, Federal Reserve Bank of Philadelphia

Commodity Prices
Rufus S. Tucker, General Motors Corporation

The Building Industry
L. Seth Schnitman, Consulting Economist

—12:30 P.M.—

LUNCHEON MEETING: THE BUSINESS OUTLOOK

Chairman: Robert W. Burgess, Western Electric Company

Speakers: Lionel D. Edie, Lionel D. Edie & Company
James F. Hughes, Smith, Barney & Company
Leonard P. Ayres, The Cleveland Trust Company

Minutes of the Annual Business Meeting

The American Statistical Association convened for the 101st annual business meeting at 9:00 A.M. Friday, December 29, 1939, at the Bellevue-Stratford Hotel in Philadelphia, Pennsylvania. President Raymond Pearl presided.

The minutes of the one-hundredth annual business meeting were approved as published in the JOURNAL.[1]

The Secretary read the Annual Report of the Board of Directors.[2] It was voted to accept the Report.

The report of the Committee on Fellows was read by its Chairman, E. Dana Durand. The Committee announced the election of the following Fellows: Theodore H. Brown, A. R. Crathorne, Halbert L. Dunn, Meredith B. Givens, Charles F. Roos, George W. Snedecor, Frederick F. Stephan, Willard L. Thorp, Ralph J. Watkins, and Joseph H. Willits. The appointment of John R. Miner to the Committee on Fellows for the period ending at the Annual Meeting in 1944 was announced. It was voted to thank the Committee for its report and its service to the Association.

The report of the Nominating Committee was presented by its Chairman, Joseph S. Davis. The Secretary reported that he had received no nominations by petition. It was voted to instruct the Secretary to cast one ballot for the candidates presented by the Nominating Committee. The ballot was cast and the following officers and directors were elected:

President F. LESLIE HAYFORD, General Motors Corporation

Vice-Presidents

Collection and Classification of Data, and Administration of Statistical Agencies
HOWARD W. GREEN, Cleveland Health Council

Statistical and Actuarial Methods and Technique, and the Teaching of Statistics
GEORGE W. SNEDECOR, Iowa State College

Facts and Methods Pertaining to Sociology, Social Welfare Problems, and Labor Statistics
NEVA R. DEARDORFF, Welfare Council of New York City

Facts and Methods Related to Biometry, Vital Statistics, Psychology and Education
ALFRED J. LOTKA, Metropolitan Life Insurance Company

Facts and Methods Bearing upon Economics and Economic Theory
RALPH J. WATKINS, National Resources Planning Board

Facts and Methods Pertaining Primarily to Business
WILLIAM A. BERRIDGE, Metropolitan Life Insurance Company

[1] This JOURNAL, 34 (March 1939), 153.
[2] This JOURNAL, p. 158.

Facts and Methods Pertaining to Financial Institutions
DONALD S. THOMPSON, Federal Deposit Insurance Corporation
Facts and Methods Pertaining to Marketing
THEODORE N. BECKMAN, Ohio State University
Directors (For the terms expiring at the Annual Meeting in 1942)
RAYMOND PEARL, The Johns Hopkins University
W. LEONARD CRUM, Harvard University
Director (For the term expiring at the Annual Meeting in 1941)
WILLARD L. THORP, Dun & Bradstreet, Inc.
Secretary-Treasurer
FREDERICK F. STEPHAN, American Statistical Association

The Secretary presented a recommendation of the Board of Directors for the amendment of By-Laws pertaining to Corporate Members. It was voted to amend By-Law 3 making it read: "3. Each Corporate Member may nominate individual associate members who shall be entitled to participate in meetings of the Association or its chapters and to receive its publications under such conditions as the Board of Directors shall from time to time prescribe; provided, that the number of associate members so nominated shall not exceed the number of regular membership dues to which the corporate membership dues are equivalent."

The Secretary presented a proposal of the Board of Directors that the By-Laws be amended to exempt from annual dues a restricted class of senior members of the Association. It was voted to amend the By-Laws by adding at the end of By-Law 2 the following sentence: "Regular Members and Fellows who have been members for 35 years, or who have reached the age of 65 years and have been members for 25 years, shall be exempt from the payment of annual dues."

A progress report was presented for the Board of Directors by Halbert L. Dunn on the proposal to establish a graded scale of dues.

The Secretary reported that the Allied Social Science Associations would meet in 1940 in Chicago and New Orleans, the American Statistical Association meeting in Chicago with the American Association for Labor Legislation, the American Sociological Society, the American Farm Economic Association, the American Marketing Association, the Institute of Mathematical Statistics, and other associations in the group, and the American Economic Association, the American Political Science Association, the American Business Law Association, and the Tax Policy League meeting in New Orleans. He reported further that all the associations in the group plan to meet together in 1941, probably in Washington, D. C.

The meeting was adjourned.

FREDERICK F. STEPHAN, *Secretary*

(Note: Following the annual business meeting it was learned that the American Farm Economic Association voted to meet in New Orleans and the American Political Science Association voted to meet in Chicago. *Ed.*)

Report of the Board of Directors

At this Annual Meeting we are not merely completing another year; we are completing a century. It has been a century of growth, a century of change, a century in which our nation has become increasingly dependent upon statistics in the everyday work of business, education, government, and research. The more we as citizens must depend on statistics the more we become concerned that they be trustworthy, adequate in scope and detail, and available without avoidable delay or expense. There is a great public interest in the integrity and efficiency of our statistical information. It has been the central interest of our Association from the time of its founding, although the activities to which it gave rise have varied during the century. We find it well stated in the following words taken from a circular issued in 1840 by the Home Secretary:

> An institution has been formed in Boston by the name of the AMERICAN STATISTICAL ASSOCIATION, for the purpose of collecting, preserving, and diffusing statistical information, in the different departments of human knowledge. One of the methods which the Association proposes to take in accomplishing this object, is to procure, by solicitation or otherwise, books, pamphlets, periodical works and written communications, relating to the subject of Statistics. It is also their intention to promote the science of Statistics, to suggest and prepare the best forms for keeping records, proposing questions, and making investigations; and to aid all those who are interested in this important object, in presenting information in the form most interesting and useful. . . . In no country is it more important that facts should be accurately sought, collected, and made known, than in this.

In 1839 there were few important compilations of statistics and they were relatively simple. Our great systems of record-keeping and fact-collecting were yet to be established. There was but little of refined analysis. The figures were interpreted in terms of common knowledge, not in terms of specialized experience or science. The library and collecting functions emphasized by our Founders were the logical expression of the broad interest we share with them in cultivating the supply of reliable statistics.

Today we emphasize other means of serving the public interest in statistics. There are great agencies, with resources that dwarf ours by comparison, which collect, preserve, and publish statistical information. There are great research organizations that use and develop the techniques of statistical analysis. We cannot compete with them; we do not wish to do so. We have encouraged their growth. Directly and indirectly we have helped to shape these instruments that are now fulfilling the purposes set forth by the Founders. Our function now is to help to improve their work and adjust it to new conditions. If we are to perform this function well we, too, must seek continually to improve our own work and adjust it to changing opportunities. Our Association is an active and productive centenarian because it has not stopped its evolution; it is a living organism, not a fossil.

As in the past our Association has held to its central purposes while modifying the procedures by which it seeks to promote them, we may expect in

the future to change the plan and emphasis of our activities without changing their fundamental objectives. Your officers are continually reviewing our various activities and considering proposals and suggestions communicated to them by officers and members. A number of such suggestions are now being studied.

Early in the century we are rounding out, our Association started the practice of establishing committees to foster the improvement of statistics in designated fields. Sometimes these committees presented their recommendations to the public officials who had the power to make them effective. In other instances, the committees brought government statisticians together to work out in cooperation the improvements that they should make and the uniform standards that they should observe. Other methods have been used—all of them active and constructive efforts to enhance the value of statistical information. During recent years and notably in this year our committee activities have been fruitful. It may be that, like the library and collecting function, this function of seeking the improvement of our basic statistical data through committee conferences may become relatively less important as government agencies accept responsibility for this function by providing frequent opportunities for informal and intimate consultation between various producers of related statistics and also between producers and representative consumers. Our Association has encouraged and aided such a change. During the next five years we may turn toward the professional problems of statistical work, toward methods of improving the quality, interpretation and use of statistics, and toward the development of our meetings and publications.

Turning now to a quick review of 1939, we find a long list of notable events and achievements. We celebrated our Centenary Anniversary at a special meeting in Boston on November 27. The representatives of quite a number of kindred associations attended this celebration. A commemorative tablet was erected at 15 Cornhill on the building in which the first meeting was held. Tonight we will complete our celebration. With profound regret we have been compelled by the intervention of war to withdraw our plans to celebrate our Centenary at a meeting next May in conjunction with the Twenty-fifth Session of the International Statistical Institute.

As we complete our first century we seek to make a strong start on the second. National and chapter officers have enlisted the aid of other members to enlarge the membership and build up a Sustaining Fund which will strengthen the Association in its work during the next five years. In large measure as a result of their efforts our membership has increased during the year by 374 members net, bringing our membership to 2,502. This growth we hope is a sound healthy growth that will enlarge our sphere of usefulness and enhance the value of our meetings.

The Centenary Sustaining Fund has exceeded $9,000. Contributions are being received at the end of the year at a rate that may bring the Fund to $10,000. Many members have given generously; others are doubtless planning to add their contributions soon. By expending the Fund during the next

five years the Association will be able to extend its usefulness to its members and to all users of statistics.

While these special activities have occupied the center of the stage during 1939, we did not neglect our regular work. The JOURNAL and *Bulletin* were edited and published. The multitudinous arrangements for this Annual Meeting were made by the officers assisted by the central office staff. The Secretary was consulted by many persons and organizations seeking information and advice. The Census Advisory Committee rendered extensive service in connection with preparations for the 1940 Census. The Joint Committee on Relief Statistics continued its advisory services to the Social Security Board and issued additional bulletins and papers. The Joint Committee on Occupational Classification completed and published a standard Convertibility List of Occupations for use by agencies producing occupational statistics. These are outstanding examples of work done by our committees the reports of which will be presented in the March issue of the JOURNAL.

Our chapters are developing increasingly interesting meetings. They are also undertaking significant committee work. The San Francisco, Connecticut, Albany, and Harrisburg Chapters have committees working on the problems and coordination of state statistics. The Harrisburg Chapter, newly organized this year, published a useful Directory of State Statisticians and started work on an index to statistical data available in the State capital. The New York Chapter is organizing study groups in several fields. The Washington Chapter has been especially active in the Centenary Membership and Sustaining Fund campaigns. It is also developing a plan of special group meetings. The Boston Chapter made arrangements for the Centenary Anniversary meeting and joined the national Association in sponsoring it. In the vigor of its chapters the Association finds great possibilities for progress in local and state statistical work. The chapters will also make contributions to the more general fields of statistics.

The Treasurer's Report shows a deficit for the year of about $900 apart from the direct expenses of the Centenary celebration and campaign. Our grant from the Rockefeller Foundation expires at the end of 1940. If the Centenary Sustaining Fund reaches or exceeds the minimum goal of $10,000 we will be able to balance our budget in 1940 without retarding our progress or curtailing further the work we do. As our Association grows, the officers must assume greater responsibilities, and so, too, must many members who take an active part in its functions.

We are writing the last words in a record of progress and achievement which was well started by the Founders one hundred years ago. We open the book of our second century with confidence that our Association will continue to grow in importance and usefulness.

MORRIS A. COPELAND
JOSEPH S. DAVIS
HALBERT L. DUNN
F. LESLIE HAYFORD
GEORGE O. MAY
RAYMOND PEARL
FREDERICK F. STEPHAN
WALTER W. STEWART

Report of the Secretary

The activities of the Association cover a wide range and are described in the report of the Board of Directors and in other reports presented in this number of the JOURNAL as well as in the several numbers of the *Bulletin* that appeared during 1939. In these reports one may find evidence of the quickened activity with which our Association completed its hundredth year. There was a similar quickening of interest in the Association, largely induced by the enthusiasm of its members and the active efforts of committees appointed by most of its chapters, which led to a record increase in its membership. During the year 565 new members were elected and 31 former members were reinstated. There were removed from the membership roll the names of 222 members whose memberships were terminated by resignation, by death, or for other reasons. The net increase of 374 members brought the total membership to 2,502, distributed as follows:

Membership Statement, December 31, 1939

Honorary members	16
Corporate members	4
Fellows	95
Regular members	2,387
Total membership	2,502

One new Life Member was elected during the year. Four Fellows were Contributing Members. The death of the following members was recorded during the year: S. D. Wicksell, *Honorary Member;* Charles F. Gettemy, *Fellow;* William Coan, Colin C. Ferguson, Henry B. Gardner, Elizabeth Grimm, L. G. Hobson, Robert E. Landman, Frans J. Linders, Elmer B. Royer, Edwin R. A. Seligman, Charles G. Smith, and Caroline Whitney, *Regular Members.*

FREDERICK F. STEPHAN, *Secretary*

Report of the Treasurer

The central event in 1939 for our Association was the celebration of our Centenary. It was the signal for special efforts to extend our membership and strengthen the financial support of our developing activities. In this we were highly successful.

Our income for 1939 was not increased very much by these efforts, for the Centenary Sustaining Fund is to be used to support the extension of Association activities during the next five years and most of the membership increase occurred too late in the year to contribute very much to the dues income of 1939. While most of the benefits of these efforts will accrue to 1940 and future years and most of the burdens fall on 1939, we are able to report a better year than the year previous.

In comparison with 1938 our income from ordinary sources increased almost $1,200, offsetting the major part of the decrease in the Rockefeller

Foundation grant. Our expenses increased $200 apart from the new item for the Index to the JOURNAL. If, however, we should exclude from the comparison the special items in 1939 for extra expenses of the Centenary Celebration and Centenary Membership Campaign, amounting to $843 (principally printing, postage, and temporary assistance), there would be a decrease of more than $600 in expenses for our regular activities (including the work of our regular staff in the Centenary campaigns). On this basis the excess of expenses over income in 1939 would be about $900. Excluding these special items of expense the net excess of expenses over income for the five-year period 1935–1939 is $440.

The balance sheet and statement of income and expenses with comparative figures for 1938 are given in the Auditor's report.

FREDERICK F. STEPHAN, *Treasurer*

Report of the Auditing Committee

The accounts of the American Statistical Association for the year ending December 31, 1939, have been audited by Price, Waterhouse & Co. We have read the report of the audit and transmit it herewith.

WILLIAM M. HOAD
MAURICE LEVEN

To the Board of Directors of
American Statistical Association

We have examined the balance sheet of the American Statistical Association as at December 31, 1939 and the statements of income and surplus for the year then ended, have reviewed the accounting procedures of the Association and have examined or tested accounting records and other supporting evidence, by methods and to the extent we deemed appropriate.

The recorded cash receipts for the year were traced to the deposits shown on the bank statements and the amounts for dues and subscriptions were tested with the membership and subscription records. The paid checks and relative vouchers were inspected in support of the cash disbursements for the year. The cash balances and the securities owned at December 31, 1939 were confirmed by inspection or by certificates from the depositaries. We did not check the membership and subscription records in detail or make any independent verification of the inventory of old journals, the office records of which are based in part on data assembled in prior years, no recent physical inventory having been taken.

In our opinion, the accompanying balance sheet and related statements of income and surplus present fairly the position of the American Statistical Association at December 31, 1939 and the results of its operations for the year, in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

PRICE, WATERHOUSE & CO.

February 29, 1940

AMERICAN STATISTICAL ASSOCIATION
BALANCE SHEETS

Assets	December 31, 1938	December 31, 1939
Cash in bank and on hand	$ 2,150.42	$ 9,319.28
Accounts and interest receivable	40.88	376.64
Investments, at cost (at market quotations $8,054.01 and $6,959.13, respectively)	8,861.67	7,818.50
Inventory of old JOURNALS, at approximate cost applied to saleable quantities	1,740.23	1,754.20
Furniture and equipment, at cost less depreciation	499.07	699.49
Prepaid expenses	103.19	
	$13,395.46	$19,968.11
Liabilities		
Accounts payable	$ 267.00	$ 1,305.13
Special account—Allied Social Science Associations	261.23	298.54
The Rockefeller Foundation grant for the Index to the JOURNAL:		
Total amount $5,000.00		
Less: Portion expended in 1939 1,036.71		3,963.29
Centenary Sustaining Fund, per statement		3,387.55
Life membership reserve	2,381.69	2,401.87
Unearned income:		
Dues	862.00	1,269.25
Subscriptions	1,633.50	1,391.25
Surplus, per statement	7,990.04	5,951.23
	$13,395.46	$19,968.11

AMERICAN STATISTICAL ASSOCIATION

INCOME STATEMENTS

	Year ending December 31, 1938	1939
INCOME:		
Dues—current year	$10,687.25	$11,467.00
Dues—prior years	59.00	39.50
Life memberships (see note)	185.45	175.09
Subscriptions	3,498.00	3,511.50
Advertising	338.55	840.64
Reprints	311.40	186.40
JOURNAL sales	269.83	354.41
Special publications	33.20	23.87
Miscellaneous	131.05	98.20
Dividends and interest (after deducting $91.04 in 1938 and $95.27 in 1939 apportioned to life membership reserve)	196.27	202.84
	$15,710.00	$16,899.45
The Rockefeller Foundation grants:		
For general purposes	4,500.00	3,000.00
For Index to the JOURNAL—portion applicable to 1939		1,036.71
	$20,210.00	$20,936.16
EXPENSES:		
JOURNAL—printing, mailing and reprints	$ 5,014.18	$ 4,993.08
Bulletin	516.30	370.39
Salaries and wages	11,798.64	11,447.20
Unemployment compensation tax	349.45	342.11
Rent	1,113.00	918.00
Office supplies, printing and mimeographing	628.34	825.36
General postage and carriage	487.21	531.85
Telephone and telegraph	225.47	245.97
Travel expense—officers	607.21	416.73
Travel expense—committees	161.75	23.40
Mimeographing—committees	46.87	38.70
Storage of old JOURNALS	72.00	72.00
Cost of old JOURNALS sold	32.40	60.95
Miscellaneous expense	322.30	407.08
Depreciation of furniture and equipment	88.07	123.44
Centenary celebration		368.51
Centenary membership campaign		474.61
Expense—Index to the JOURNAL		1,036.71
	$21,463.19	$22,696.09
Excess of expenses over income	$ 1,253.19	$ 1,759.93

Note: In accordance with a resolution of the Board of Directors, March 31, 1936, the life membership reserve is computed on the basis of the combined an-

AMERICAN STATISTICAL ASSOCIATION

SURPLUS STATEMENT
YEAR ENDING DECEMBER 31, 1939

Balance December 31, 1938		$7,990.04
Deduct:		
Excess of expenses over income for the year ending December 31, 1939, per income statement	$1,759.93	
Loss on sale of securities	278.88	2,038.81
Balance December 31, 1939		$5,951.23

STATEMENT OF CENTENARY SUSTAINING FUND

Total contributions and pledges received to December 31, 1939 (see note)	$9,164.00
Less: Pledges due subsequent to December 31, 1939	5,013.00
Amounts received in 1939	$4,151.00
Less: Expenses of campaign (printing, postage and temporary assistance)	763.45
Balance December 31, 1939, per balance sheet	$3,387.55

Note: The Centenary Sustaining Fund was created in connection with the solicitation of contributions toward the support of the activities of the Association during the years 1940 to 1944, inclusive, with the intention that one-fifth of the fund be available for use in each of such years. In addition to the amount of $9,164.00 shown above, contributions and pledges received during January and February 1940 amounted to $1,081.50.

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nuity table of mortality with assumed interest at 4% per annum and an assumed annuity of $5.00 per life member. The amount treated as income in each year represents the excess of the reserve at the beginning of the year plus interest for the year and new life membership receipts over the required reserve at the end of the year.

Reports of Committees and Representatives:

Report of the Advisory Committee on the Census

Five meetings of the Committee have been held during 1939—February 10 and 11; March 31 and April 1; June 16, 17, and 18; September 22 and 23; December 8 and 9. The members have devoted more than usual time and energy to their work, as the date for the beginning of the Sixteenth Census approached. The personnel of the Committee remained unchanged.

Discussion at the first meeting of the year was directed chiefly to the problem of providing the means by which those persons and agencies, private and governmental, who were interested in the inquiries of the 1940 Census, might have opportunity to bring their proposals to the attention of the Bureau. Finally, the Committee recommended to the Director that he arrange at Washington, by invitation, a special conference of interested parties, for each of the fields—Population, Manufactures, and Distribution. (Agriculture had been provided for already by the appointment of a special Committee to advise the Bureau.) These general conferences were held in March, and many proposals for additions and changes in the 1940 Census schedules in each field were offered and discussed.

The Committee also urged that, following the general conferences and including some of the participants, the Director should appoint small, technical committees, competent in the different fields, to work over all suggestions and make recommendations to the Bureau. Such a special committee for Population was appointed by the Director, consisting of five members, including the Secretary of the American Statistical Association and a representative of the Central Statistical Board. This small committee functioned after the general conference.

After considering the proposed changes in the population inquiries, as compared with those made in 1930, the Committee strongly recommended to the Director that a trial census be taken in a few areas for the purpose of testing out new questions and the adequacy of instructions to enumerators. The results of a similar trial census in Agriculture were already available for discussion.

At the March–April meeting discussion centered chiefly upon the detailed suggestions made by the three general conferences which had met early in March. The minutes of these conferences had already been sent to members of the Advisory Committee. They were considered now in collaboration with representatives of the Bureau in relation to the schedules and tabulations of the Sixteenth Census.

The special committees were expected to complete their work in time to permit the Bureau experts to draw up the schedule forms by June first. It was planned to submit these schedules at that time to the Central Statistical Board for criticism and final suggestions.

The mid-June meeting, for three days, was devoted entirely to discussion

of the tentative schedules, in the four main census fields, which had been submitted to the Central Statistical Board early in June. A memorandum of seventy-four pages from the Central Statistical Board was referred to the Advisory Committee by the Director and the recommendations were carefully considered in detail. The advice of the Committee with reference to the final content of the schedules was recorded for the use of the Director and his associates in making up the final forms for the approval of the Secretary.

At the September meeting the results of the trial population census, taken on August 14 in St. Joseph and Marshall Counties, Indiana, which include the city of South Bend, were presented to the Committee. The discussion developed the conclusion that this experience had proved very valuable to the Bureau in testing certain new questions, such as income, in improving techniques in the field, and in formulating better instructions for the enumerators. Objective tests for selection of enumerators were used with excellent results, and a new plan of having field inspectors was tried, one in charge of each ten enumerators.

The trial census also enabled the Bureau to try out a supplementary schedule taken for a sample of five per cent of the population, every twentieth individual enumerated, in addition to the general population schedule. Sampling procedures, replacing or supplementing complete enumeration, have been recommended to the Bureau by the Advisory Committee for some time past. We are gratified to see the adoption of these techniques in the 1940 Population Census. It is hoped that this procedure may help to solve some of the difficulties of increasing demands upon the Bureau for new information, with limited funds available. An overcrowded schedule for complete enumeration endangers the accuracy of the returns and is too expensive for adequate tabulation. Some inquiries do not require complete enumeration.

The Committee considered item by item the schedule proposed for the new census of housing, authorized by Congress but for which no appropriation had yet been provided. A strong resolution was passed urging that the taking of this housing census by the Bureau be conditioned upon the appropriation of specific funds for this purpose, in addition to those provided for the regular population census.

The final meeting of the year was devoted to consideration of detailed plans for the tabulation and presentation of the returns on Distribution and on Manufactures. Table forms showing details of classification and cross-classification were presented for discussion. Plans for special studies in these fields were suggested. The Committee at several previous sessions has strongly urged the Director to make the Sixteenth Census outstanding by providing more adequate tabulation and analysis of the data than for previous censuses. For this purpose the Committee has recommended that plans be made well in advance and that funds be set aside for the specific work of analysis and special studies.

A meeting of the Committee was planned for January 5 and 6, 1940, at which similar consideration will be given to tabulations on Population and

Agriculture. Tentative lists of topics for monographs and special studies in the different fields have already been presented to the Committee. These will be given further special consideration at a meeting in March, 1940.

During the year the Committee has considered and disposed of a number of recommendations, made by Special Advisory Committees for the Division of Vital Statistics and the Division of State and Local Government, referred by the Director to us for final action and recommendation.

ROBERT E. CHADDOCK, *Chairman*
MURRAY R. BENEDICT
PAUL T. CHERINGTON
J. FREDERIC DEWHURST
WILLIAM F. OGBURN
WILLARD L. THORP

Report of the Joint Committee on Metropolitan Districts

The Joint Committee on Metropolitan Districts held four meetings during 1939. Most of the work related to the definition of the metropolitan districts to be used mainly in connection with the 1940 Census of Population. The committee has submitted recommendations to the Bureau of the Census relating to the composition of districts for some one hundred central cities with a population of roughly 100,000 or more and also for some one hundred central cities of 50,000–100,000 population. The report to the Census Bureau also covered suggested changes in the presentation of tabular material. Furthermore, the committee studied the make-up of the industrial areas used for the biennial censuses of manufactures and suggested certain changes both in size and in areas included.

GLENN E. MCLAUGHLIN

Report of the Committee on Census Enumeration Areas

In May, 1939, a meeting of the Committee was held in Washington. At this time the importance of getting the table forms for census tracts worked out for the 1940 Census as soon as the 1940 schedules became available was discussed. The cost to the cities of data by census tracts was also given consideration.

In December a meeting of the Committee was held in Philadelphia, which was attended by representatives of many of the census tract cities and other interested individuals. In the morning session a paper was presented by Dr. Douglas E. Scates of Duke University on "An Economic Index for Census Tracts of Cincinnati," showing the results of various methods of combining rents and values. The items included in the 1940 Population schedule, the 1940 Population Supplementary schedule, and the Housing schedule were dissussed by Dr. Leon E. Truesdell, Chief Statistician for Population, Bureau of the Census.

In the presentation of the analysis of the questionnaire sent by the Chairman to key persons in cities having census tract data for 1930, it was evident that 1930 Tables 1, 2, 9, and 10 had been found to be the most valuable

tables. Tables presenting material to be made available for the first time by the 1940 Census were discussed. Dr. Truesdell stated that he hoped to have a series of recommended table forms ready for the consideration of the Committee and key persons early next spring.

At the noon session Mr. C. E. Batschelet, Geographer of the Bureau of the Census, presented a paper, "The 1940 Census Tract Cities," in which he stated that: 71 cities of 50,000 or more inhabitants have been laid out in census tracts and approved by the Bureau of the Census, 27 cities have requested approval since the deadline of a year ago, and 24 cities have laid out the area outside the central city by census tracts.

Dr. Ernest M. Fisher, Chief Economist of the Federal Housing Administration, presented a paper, "Housing Data Schedule for 1940 Census." He reviewed the proposed 1940 housing area survey and made a plea for the tabulation of some data by blocks as well as by census tracts.

HOWARD WHIPPLE GREEN, *Chairman*
C. E. BATSCHELET
ROBERT E. CHADDOCK
ERNEST M. FISHER
CHARLES S. NEWCOMB
VERGIL D. REED
LEON E. TRUESDELL

Report of the Joint Committee on Occupational Classification

During the past year this Committee and its Technical Subcommittee continued to work on the preparation of an occupational classification which could be used on a uniform basis by the leading agencies gathering occupational data. A preliminary list of occupational titles was completed in the spring and submitted to approximately 100 people highly qualified in the field of occupational statistics. Many worth while criticisms and suggestions were received. The list was then revised and published in the December issue of the *Journal of the American Statistical Association* in the article "The Convertibility List of Occupations and the Problems of Developing It" by Gladys L. Palmer. The Committee recommends that the list in its present form be used over a limited period (perhaps the next five years) and that it be modified subsequently as appears desirable in the light of the experience thus gained.

The Convertibility List contains 327 titles arranged in 9 major groups (4 of which have 2 main subgroups), and provides for the classification of the entire working population of the nation. As an aid in making it suitable for use with occupational data for a wide variety of populations—for example, areas where the total number of workers is small, or selected groups containing few workers in certain of the major occupational classes—the 327 detailed items are being combined into an intermediate grouping of 95 items.

In preparing the *Convertibility List of Occupations* it was found desirable to make industrial subdivisions of certain occupational titles, e.g. "Proprietors, managers, and officials, n.e.c." and "Operatives n.e.c.," and to base these industrial subdivisions on the *Standard Industrial Classification*. A re-

grouping of some of the titles in this industrial classification appeared necessary because it was developed primarily for dealing with returns from establishments or employing units rather than from workers or members of their families. This regrouping was done by your Committee in cooperation with the Committee on Industrial Classification, and has been released in a mimeographed report entitled *Industrial Classification for Reports from Individuals.* The classification contains 132 titles for industries or groups of industries, chosen because they employ a large number of workers, and can be identified fairly accurately from reports obtained through a house-to-house canvass.

Several agencies gathering occupational statistics already have made plans to utilize the Convertibility List throughout their tabulations, or to arrange for regrouping their own titles in certain tables so as to obtain comparable data. The occupational tables of the 1940 Census of Population will agree almost exactly with the list, the only exceptions being that the subgroups under "Farmers" and "Porters" will not be utilized while several other titles will be subdivided. Tables to be obtained in the projected inventory of the active files of work registrants in public employment offices in April 1940 will carry occupational stubs which will be convertible to the Committee's list except for a few specific occupations and for the distinction between "Operatives and kindred workers n.e.c." and "Laborers n.e.c." in the various industry groups.[1] The use of the list by these agencies and the others which are adopting it will result in a great increase in the amount of occupational data available on a comparable basis.

The Committee has not had the staff or funds necessary to prepare a code manual for use in connection with the Convertibility List. It believes that one should be prepared, however, and is exploring ways and means of obtaining the support required. Until such a manual is available, prospective users of the list are referred to the *Alphabetical Index of Occupations* (to be published by the Bureau of the Census early in 1940) or to the *Dictionary of Occupational Terms* of the United States Employment Service (now in press), depending on the amount and kind of detail available in the occupational information to be classified.

The following changes in Committee membership occurred during the year: E. Dana Durand was added as a representative of the Central Statistical Board, and Edward D. Hollander succeeded W. H. Stead (who resigned) as representative of the Bureau of Employment Security (formerly the U. S. Employment Service).

HOWARD B. MYERS, *Chairman*
P. K. WHELPTON, *Secretary*
E. DANA DURAND
MEREDITH B. GIVENS
EDWARD D. HOLLANDER
MISS ARYNESS JOY
MERRILL G. MURRAY
MISS GLADYS PALMER
LEON E. TRUESDELL

[1] *The Convertibility List of Occupations* has been followed closely in "Occupations of Applicants for Work—New York City, Active File of New York State Employment Service." New York State Department of Labor—September 1939.

Report of the Joint Committee on Relief Statistics

The activities of this committee during the year followed the pattern established in the two preceding years. The committee endeavored to keep advised of statistical developments in the federal and state agencies concerned with relief administration and continued efforts to maintain contact with the personnel responsible for relief statistics and related research in these agencies. It continued to serve, at the request of the Social Security Board, as an advisory committee to the Board's Division of Public Assistance Research, and a major portion of its work during this year was performed by sub-committees appointed to consider particular problems raised in connection with the Division's work. A total of eight sub-committee meetings were held during the year for this purpose.

Three issues of the committee's informal *Bulletin of Information for Relief Statisticians* were prepared and distributed during the year, and three additional papers were issued in its series of Papers on Relief Statistics. The titles and authors of these papers were as follows:

No. 7—Summaries of Relief Cases and Expenditures for Purpose of Administrative Control, by Edward T. Frankel and Pirie H. Perenyi.

No. 8—Standards for Periodic Publications of Bureaus of Research and Statistics, by Mary Ross.

No. 9—Place of Research in the Long-Time Planning of a State Program for Public Welfare, by David M. Schneider.

A sub-committee, of which Helen R. Jeter was chairman, arranged and conducted two sessions on the subject of research in social agencies at the annual meeting of the National Conference of Social Work in Buffalo on June 19 and 20. The committee also participated in the second conference of state directors of research and statistics held under the auspices of the Social Security Board in Washington during the week of October 23. The attendance at and general quality of this conference was indicative of the rapid progress that has been made in the development of statistical work in state welfare agencies during the brief period that the Social Security legislation has been in effect.

RALPH G. HURLIN, *Chairman*
PAUL WEBBINK, *Secretary*
NEVA R. DEARDORFF
EMIL J. FRANKEL
ANNE E. GEDDES
HELEN R. JETER
HOWARD B. MYERS
ALLEN R. POTTER
EMERSON ROSS
SAYA S. SCHWARTZ
HERMAN M. SOMERS
FREDERICK F. STEPHAN

Report of the Committee on Statistics of Institutions for Mental and Physical Disorders

The committee has held two stated meetings, well attended, during the past year. In general its effort has been directed mainly toward cooperation

with official state and national agencies concerned with betterment of institutional statistics, and an effort to activate voluntary organizations having similar or related interest.

The services of Mr. Frederick Brown, of the committee, who for several years has acted as a special agent of the Bureau of the Census were terminated by that Bureau in August, 1939. Mr. Elliott H. Pennell, statistician of the United States Public Health Service, another member of the committee, acting under special assignment by the Surgeon General, has been transferred to other duties in the Public Health Service. These changes in the official relations of the committee, though unavoidable, have made a temporary break in governmental associations which have been most helpful to the committee in the past, and were expected to be particularly valuable in the coming year. It is the Committee's intention, however, to reëstablish its relationships with the Census Bureau and the Public Health Service as soon as possible through other members of the committee or otherwise as may be acceptable to the agencies concerned. The committee feels the maintenance of the vitality of such associations with responsible officials of the national government offers the best guarantee of productive effort to better institutional statistics. It recommends, therefore, to the Association that suitable representatives, both of the Bureau of the Census and the United States Public Health Service, be appointed members of the committee for 1940.

The committee regrets to record its acceptance of the resignation from the committee of Miss Mary Augusta Clark. Miss Clark, who has served the committee devotedly since its beginning, has been obliged to retire from active work because of ill health. Her place on the committee cannot well be filled, but the necessities of the committee's program compels the appointment of another having special interest in institutional services and skill in the planning and interpretation of their statistical efforts.

In the past year, the committee has limited itself almost exclusively to a consideration of means and methods of securing, on a national scale, more complete uniform and accurate data on general hospitals. Since these hospitals represent the most important group of institutions for physical and mental disorders, and at the same time, the group concerning which adequate statistics are so immediately necessary in meeting the public need for sickness care, the committee feels that it may to advantage continue to carry on this work as its major project for 1940.

As the result of its discussions to date, the committee has prepared and submits as an appendix to this report, a brief summary outline defining the general hospital field and setting forth as simply as possible the elements of a plan for gathering general hospital statistics on a national scale. The plan so offered must be regarded as tentative only, and to be amended as needed in accordance with the criticism and suggestion offered by voluntary and governmental agencies interested.

In anticipation of the forthcoming decennial census, your committee undertook to secure the cooperation of the American Hospital Association, the

Catholic Hospital Association, and other hospital agencies in support of a plan to include a special census of institutions as a feature of the general decennial census of 1940. Other interested organizations made a like plea to the Census Bureau. Whether the desired action will be taken remains to be seen.

It has been recommended that the Census Bureau collect statistics of general hospitals along with its annual compilation of other institution statistics. The Bureau, however, is of the opinion that the present law relating to the collection of institution statistics does not permit such extension of its authority. The committee urges, therefore, that the existing law defining the authority of the Census Bureau be amended so as to provide for the annual collection of general and special hospital statistics, in addition to those institutional statistics now provided for. A special sub-committee was appointed at the last meeting of the committee to carry on negotiations with the Census Bureau with this purpose in view.

HORATIO M. POLLOCK, *Chairman*
CARL E. MCCOMBS, *Secretary*
FREDERICK W. BROWN
MARY AUGUSTA CLARK
EMIL FRANKEL
ELLIOTT H. PENNELL
DAVID M. SCHNEIDER
JOSEPH ZUBIN

Report of the Committee on Statistics of Delinquents and Criminals

Late in 1938 the attention of the Committee was drawn to the new Uniform Criminal Statistics Act drafted by the National Conference of Commissioners on Uniform State Laws and finally adopted by that Conference and endorsed by the American Bar Association during the summer of 1938. The deficiencies of this Act were so obvious to criminal statisticians that the Committee, after a questionnaire sent to over thirty competent persons, presented a memorandum to the Conference, calling attention to the defects and urging that the Act be reconsidered. It is gratifying to note that at its annual meeting last summer, the matter was brought up for discussion by the Conference and that the Act was referred to a new committee for revision.

The Committee on Statistics of Delinquents and Criminals also arranged a round table conference at the annual meeting to discuss the statistical presentation in the annual prison report of certain phases of prison administration.

THORSTEN SELLIN, *Chairman*

Joint Committee on Income Tax Statistics

The Committee has had no meeting although the Chairman has been in contact by correspondence or interview with the other members. The chief reason for the lack of activity of the Committee at present is that the Treasury has actively functioning a General Committee on Statistics of Income.

This Treasury Committee is comprised of various specialists within the research divisions of the Treasury and in the Statistical Section of the Bureau of Internal Revenue. The Chairman of the Joint Committee is a regular member of the Treasury's General Committee, and the General Committee invites from time to time other outsiders to express views and make suggestions concerning changes in the tabulations in Statistics of Income. Under these circumstances, much of the initiative for improvement in the income tax data now appears in the Treasury's General Committee; and the occasion for active work in initiating changes by such an outside body as the Joint Committee seems largely to have disappeared. In view of these circumstances, I recommend that the American Statistical Association discontinue its participation in the Joint Committee and discharge its own committee which is a delegation to the Joint Committee. It will continue to be possible for outside professional experts to contribute to the work of improving the income tax statistics, either by taking the initiative themselves and communicating with the Treasury's General Committee or by responding to specific inquiries which may be submitted to them by the Treasury's General Committee.

W. L. CRUM, *Chairman*

Report of the Joint Committee for the Development of Statistical Applications in Engineering and Manufacturing

During the year members of our committee have been called upon to confer with several engineering committees and standardizing bodies on matters pertaining to the application of statistics to their problems. Members of our committee have also been called upon to discuss the applications of statistics before three engineering and scientific groups, and problems and questions have been referred to the committee by engineers from several different industries.

WALTER A. SHEWHART, *Chairman*
CHURCHILL EISENHART

Report of the Social Science Research Council, 1938–1939

The Council prosecuted during 1938–39 a program of research with the twofold purpose of improving the capacity for achievement of the social sciences and of applying existing capacity in the service of society.

The first of these objectives involved undertakings with respect to research personnel, research organization, research materials, research methods, and the advancement of scientific knowledge.

THE COUNCIL

in relation to research personnel

Maintained five pre-doctoral fellows in the second year of graduate study, all of whom had held Council fellowships during their first graduate year, in the amount of $7,230.

Maintained sixteen fellows for pre-doctoral field training in the amount of $32,826; made nineteen appointments for 1939–40; and assured awards for 1940–41.

Maintained four post-doctoral research training fellows, in the amount of $9,846; made ten appointments for 1939–40 (one jointly of man and wife); and assured awards for 1940–41.

Issued a directory of all fellows, post-doctoral, pre-doctoral, agricultural, and Southern, who have been appointed by the Council.

Established a committee to examine problems of research training.

Provided forty-one Council grants-in-aid to assist in the completion of research by mature scholars, in the amount of $21,640; made three supplementary and thirty-eight new awards for 1939–40; and assured awards for 1940–41.

Provided eight grants-in-aid under geographical limitations to the South, in the amount of $2,700; made ten awards for 1939–40; and assured awards for 1940–41.

in relation to research organization

Began an examination of organization for research in the United States.

in relation to research materials

Stimulated development and use of methods of reproduction other than print, and study of copyright law in relation to reproduction of materials.

Completed a demonstration of the possibilities of publication on a sliding scale of prices according to number of advance subscriptions and costs under various types of print or effect.

Developed plans and advised on use of WPA labor in the improvement of materials for research.

Studied areal problems of cataloguing.

in relation to research methods

Secured a number of critical analyses of outstanding American studies of recent years, held conferences in relation to two of the studies and analyses, and published the materials on Thomas' and Znaniecki's *Polish Peasant*.

In endeavoring to apply the social sciences to immediate service to society

THE COUNCIL

in the field of social security

Prosecuted numerous studies and communicated results promptly to administrative officials, national, state, and local.

Published studies on the coordination of the various social insurances in Great Britain and Germany, on problems and procedures of unemployment compensation, on trends, causes, and effects of labor turnover, and on seasonal variations in employment.

Completed for publication a study of old age security abroad.

Issued mimeographed suggestions for research on relief, and an outline of policy questions in relief.

in relation to public administration

Published reports on administration of old age assistance and on public employment services.

Completed studies of the manager government in various cities, and published as separates a number of them in advance of comprehensive publication.

Completed a survey of bureaus of governmental research.

Continued a study of the administration of the Department of Agriculture, and a survey of training for public administration.

Continued planning of research in specific areas and stimulation of its execution by individual scientists.

in relation to economic stability

Continued support of a series of studies on credit and banking in relation to stability: under the auspices of the National Bureau of Economic Research, work was completed on a handbook of statistical data on urban residential real estate, and two pamphlets on special phases of real estate, financing were published by the Bureau.

Initiated an analysis of factors in employment, involving the general economic system of the country.

Conferences were held during the year on fiscal aspects of the business cycle, on industrial relations, on cultural islands, on urbanism, in the South on population problems, and on the Pacific Coast on research related to war.

Work of the Council during the year was generously supported by the Carnegie Corporation of New York, and General Education Board, the Julius Rosenwald Fund, and the Russell Sage Foundation. New grants to the Council totaled $60,000; $5,000 for general administration; $20,000 for research in social security; $20,000 for research in public administration; and $15,000 for Southern grants-in-aid.

STUART A. RICE
EDWIN B. WILSON
O. C. STINE

List of Committees and Representatives for 1939

Committee on Fellows[1]

E. Dana Durand
Walter A. Shewhart
F. Leslie Hayford
Frank A. Ross
W. L. Crum

Committee on Nominations

J. S. Davis, *Chairman*
J. Frederic Dewhurst
Forrest E. Linder

Auditing Committee

William M. Hoad
Maurice Leven

Committee on Investments[2]

F. Leslie Hayford, *Chairman*
George O. May
Walter W. Stewart

Biometrics Section Committee

George W. Snedecor, *Chairman*
Joseph Berkson, *Secretary*
C. I. Bliss
Halbert L. Dunn
Alfred J. Lotka
Richard E. Scammon
S. S. Wilks

Committee on the Centenary Celebration Program

E. Dana Durand, *Chairman*
Edmund S. Cogswell
John Dickinson
Halbert L. Dunn
Stuart A. Rice
Woodlief Thomas
Raymond Pearl, *ex officio*
Frederick F. Stephan, *ex officio*

Census Advisory Committee

Robert E. Chaddock, *Chairman*
Murray R. Benedict
Paul T. Cherington
J. Frederic Dewhurst
William F. Ogburn
Willard L. Thorp

[1] With terms expiring at the end of 1939, 1940, 1941, 1942, 1943, respectively.

[2] Appointed in accordance with By-Law 5 to supervise the investment of the Association's surplus funds.

Committee on Census Enumeration Areas

Howard Whipple Green, *Chairman*
Clarence E. Batschelet
Robert E. Chaddock
Ernest M. Fisher
Charles S. Newcomb
Vergil D. Reed
Leon E. Truesdell

Committee on Statistics of Delinquents and Criminals

Thorsten Sellin, *Chairman*
Ronald H. Beattie, *Secretary*
C. E. Gehlke
Rolf T. Harbo
George B. Vold

Joint Committee on Income Tax Statistics (With the American Economic Association and American Institute of Accountants)

W. Leonard Crum, *Chairman*
J. Franklin Ebersole[3]
Ralph C. Epstein[3]
Henry B. Fernald[4]
David Friday
Robert M. Haig[3]
Simon Kuznets
Norman L. McLaren[4]
Robert H. Montgomery[4]

Committee on Statistics of Institutions for Mental and Physical Disorders

Horatio M. Pollock, *Chairman*
Carl E. McCombs, *Secretary*
Frederick W. Brown
Mary Augusta Clark
Emil Frankel
Elliott H. Pennell
David M. Schneider
Joseph Zubin

Committee on Labor Statistics

J. Frederic Dewhurst, *Chairman*
Meredith B. Givens, *Vice-Chairman*
Ewan Clague
Margaret Elliott
O. A. Fried
Edward D. Hollander
Aryness Joy
Solomon Kuznets
Gladys L. Palmer
Eugene B. Patton
Paul L. Stanchfield
Sidney W. Wilcox

Joint Committee on Metropolitan Districts (With the American Marketing Association and the Chamber of Commerce of the United States)

Paul T. Cherington,[5] *Chairman*
T. W. Howard[6]
Glenn E. McLaughlin

[3] Appointed by the American Economic Association.
[4] Appointed by the American Institute of Accountants.
[5] Appointed by the American Marketing Association.
[6] Appointed by the Chamber of Commerce of the United States.

Joint Committee on Occupational Classification (With the Central Statistical Board)

Howard B. Myers, *Chairman*	Work Projects Administration
P. K. Whelpton, *Secretary*	Central Statistical Board
E. Dana Durand	Central Statistical Board
Meredith B. Givens	New York State Department of Labor
Edward D. Hollander	Bureau of Employment Security
Aryness Joy	Bureau of Labor Statistics
Merrill G. Murray	Bureau of Old-Age and Survivors Insurance, Social Security Board
Gladys L. Palmer	American Statistical Association
Leon E. Truesdell	Bureau of the Census

Joint Committee on Relief Statistics (With the American Public Welfare Association)

Ralph G. Hurlin, *Chairman*	Howard B. Myers[7]
Paul Webbink, *Secretary*	Allen R. Potter[7]
Neva R. Deardorff	Emerson Ross
Emil J. Frankel[7]	Saya S. Schwartz[7]
Anne E. Geddes	Herman M. Somers
Helen R. Jeter[7]	Frederick F. Stephan

Committee on Sociometrics

George A. Lundberg, *Chairman*	Samuel A. Stouffer
F. Stuart Chapin	Dorothy S. Thomas
Calvert L. Dedrick	George B. Vold
Stuart A. Rice	

Representative on the Board of Directors of the National Bureau of Economic Research

Winfield W. Riefler

Members of the Social Science Research Council

Stuart A. Rice (For the term expiring December 31, 1939)
Edwin B. Wilson (For the term expiring December 31, 1940)
O. C. Stine (For the term expiring December 31, 1941)

Representative on the Council of the American Association for the Advancement of Science

Stuart A. Rice

[7] Appointed by the American Public Welfare Association.

Representatives on the Joint Committee for the Development of Statistical Applications in Engineering and Manufacturing

Walter A. Shewhart Churchill Eisenhart

Representative on the Sectional Committee on Standards for Graphic Presentation

A. H. Richardson

Member of the American Documentation Institute

Frederick F. Stephan

BOOK REVIEWS

GLENN E. MCLAUGHLIN
Review Editor

Methods of Statistical Analysis, by C. H. Goulden. New York: John Wiley Sons, Inc. 1939. vii, 277 pp. $3.50.

Within recent years a considerable number of elementary statistics textbooks have appeared in agriculture, biology, economics, education, psychology and other fields in which statistical methods play an important part. Few of these books go very far beyond what is commonly called "descriptive statistics," that is the description of data by means of simple averages, coefficients of various kinds, curve fitting, etc. The majority of them cover practically the same body of principles, their differences being mainly in the subject matter of the illustrative examples. Too little attention has often been paid to the possibilities and limitations of methods of drawing inferences from the data, and many authors have failed to treat adequately, if at all, the most recently developed statistical techniques. Dr. Goulden's book suffers considerably less than most statistics books from these deficiencies, particularly the latter. His book is primarily a contribution to the application of recent work in the design of experiments by R. A. Fisher, F. Yates, and others including Dr. Goulden himself. Dr. Goulden has had a great deal of practical experience in agricultural research work at the Dominion Rust Research Laboratory at Winnipeg and as a result lays major emphasis on the practical aspects of statistics without attempting to enter into the underlying mathematics very critically. He assumes that his readers are familiar with the elements of descriptive statistics and consequently devotes comparatively little space to the usual elementary statistical ideas. Little time is lost in getting the reader into regression methods, tests of independence and of goodness of fit, analysis of variance and covariance, and field plot arrangements. All of the methods are discussed in connection with actual data from life-sized experiments.

The most important feature of Dr. Goulden's book is the detailed and systematic treatment of field plot arrangements. About one-fourth of the entire book is devoted to discussion and analysis of data arising from randomized blocks, Latin squares, split plot and factorial experiments, incomplete block experiments, and other rather highly specialized arrangements which the author himself has used in his own work. The author exhibits an intimate practical knowledge of field plot technique.

Although this book would hardly be appropriate as a beginning text in statistics, it would provide excellent practical material for supplementary reading for the student who has been introduced to the main principles of statistics. The agronomist, cereal chemist, plant breeder and other research workers, particularly in agricultural science, who require a practical knowl-

edge of statistical methods will undoubtedly find Dr. Goulden's book a very useful manual.

S. S. WILKS

Princeton University

Tests of Significance, What They Mean and How to Use Them, by John H. Smith. Chicago: The University of Chicago Press. 1939. ix, 90 pp. $1.00.

A wealth of interesting material and careful reasoning is contained in this small, inexpensive pamphlet, which describes the common tests of significance based on u, chi-square, t, F, and z and derives the sampling distributions for all except the last of these.

The title is somewhat misleading since the author's aim is more to explain the meaning and logical bases of the significance tests than to tell the research worker the exact procedures for using them. The latter job is done well enough in the texts by Croxton and Cowden, Mills, etc., but the former, which is equally important, has heretofore been largely neglected. In the first, mainly non-mathematical, portion of the work, Smith emphasizes that a test of significance, say of the deviation of a sample mean, is actually a test of an *entire body of hypotheses*. Only when we know to what extent our sample and sampling procedure satisfy the requirements of normality, independence, etc. can we properly evaluate our result with respect to the main point tested. The result of a significance test should be regarded as one piece of evidence relative to an hypothesis, rather than as decisive one way or the other according as P does or does not exceed some arbitrary, predetermined level of significance. Finally the author shows that most of the common tests depend upon sums of squares of independent variates, each of which is normally distributed about a mean of zero with unit variance, i.e. the chi-square distribution.

In his mathematical appendices, Smith derives the most important sampling distributions in elegant fashion. In particular, the practice of preceding the general derivation by that for the simplest case of two or three variates adds greatly to the pedagogical value of the explanations. The tables giving the comparisons between the normal curve and the two cases of the binomial distribution for exponents equal to 400 should serve to clarify thinking on the approximation made in substituting the former for the latter in significance tests.

The compressed size of the volume probably made certain omissions and conciseness of expression unavoidable. This reviewer would have liked to see a discussion of the use of chi-square for determining the reliability of a sample standard deviation, and of the Neyman-Pearson theory for testing hypotheses. More careful wording of the Chicago height example on page 12 would have aided the exposition of a good thought. The graphs of chi-square over n may give the reader a distorted view of the relative sizes of

the chi-square graphs themselves.[1] At times, the author seems uncertain as to the audience he is addressing. In some portions, the book gives meticulous detail and can be easily followed even by a beginning student; most of the volume, however, requires a rather good statistical background for full appreciation. A knowledge of elementary probability theory and a little advanced calculus suffice for the remarkably well-written mathematical chapters.

This book's main value is in laying clear the logical bases and limitations of significance tests. The research worker who would like to be able to judge accurately when he can apply these tests, and what his results mean afterwards would do well to read this pamphlet carefully. The widespread use of this book would do much to offset the weakness in explanation of logical foundations which characterizes many of the ordinary texts, and thus prevent a good deal of misuse of the statistical method.

Harry Schwartz

Columbia University

Initiation a L'analyse Statistique, by Léo Dugé de Bernonville. Paris: Librarie Générale de Droit et de Jurisprudence. L'Économie Politique Contemporaine, Colection Dirigée par Bertrand Nogaro, Volume XIX. 1939. 232 pp.

This volume is one of a series in contemporary political economy. The author's stated purpose is to present an easy resumé of the primary ideas of statistical analysis. This aim appears to be more than well attained. The preface indicates a refreshingly realistic viewpoint in regard to analytic tools for economic statistics. In the first six chapters a compact survey is given of basic concepts—the principal averages, measures of dispersion, index numbers and graphical presentation. The next five chapters are devoted to simple curve fitting, correlation of double entry series, time series and covariation, partial and multiple correlation. The last chapter on statistical induction deals somewhat in detail with the principal elementary notions of probability, referring very briefly to normal and asymmetrical distributions, and also, to the first modern refinements in testing goodness of fit, Chi-square and the t-test.

In most topics treated the emphasis is on the economic-statistical approach. The exposition throughout has the lucidity and the neat perspicuity that so often graces French scientific writing. Repeatedly, the author presents resumés of elementals in which underlying assumptions are presented in clear-cut simplicity, with the mathematical analysis judiciously relevant. The exposition of dispersion, index numbers, and the conventional time series analysis is particularly felicitous.

Distinctive continental technique is recognized in the numerous measures

[1] Compare Smith, p. 68, with Croxton and Cowden, *Applied General Statistics* (New York, Prentice-Hall, 1939), p. 883.

of dispersion by all possible pairs of data differences; likewise, by the Fréchét interpretation of r as part correlation coefficient and part correlation ratio. A neat comparison is presented of diverse types of procedure for analysis of seasonal variation. The graph on page 158 emphasizes the inconclusive difference between the familiar link-relative method and the rather technical mathematical process evolved a few years ago at the Institut fuer Konjunkturforschung of Vienna.

Within the limited scope set for the book, the author may be justified in omitting discussion of the elaborate multiple correlation of large numbers of time series, popular in recent years. He also makes only cursory mention of the modern elaborations of statistical inference measures so often stressed in recent English and American literature. This is dictated by the limited scope of the book; also, by its motivated selection. In a valuable introductory chapter the author raises the pointed question whether analytic methods in their present development have sufficient practical relevance in the study of economic forces as presented in actual statistics.

A few misprints have been noted, which, however, can be readily corrected by the context. In another edition supplementary remarks might advantageously be added on certain points. Reference might be made to the method of Dunham Jackson for resolving the ambiguous case in the computation of the median (Whittaker and Robinson, *Calculus of Observations*, Paragraph 102). In connection with the method proposed by Wald for seasonal analysis, mention might be made of a somewhat similar method presented in Annals of Mathematical Statistics, 1930 (from the Detroit-Edison Statistical Department).

MAX SASULY

Social Security Board

Statistics Applied to Education and Psychology, by Clarence T. Gray and David F. Votaw. New York: The Ronald Press Company. 1939. xiv, 278 pp. $3.25.

The professionalization of our public school teachers will be more nearly achieved when they are trained to read with understanding, educational and psychological literature. An important step in this direction is training in statistics in order that they may properly interpret statistical concepts so frequently found in modern books and journals. (Statistical training might very well be substituted for, let us say, a two semester course in "The Psychology of Long Division!") Here is a textbook which attempts not only to introduce the beginner to statistical techniques but also to emphasize applications in the solution of educational problems. The two are closely integrated throughout the book.

A somewhat greater number of statistical devices is discussed than is usually the case in the so-called simple textbooks on statistics. Tables and figures are clearly and adequately labelled. Symbols used in formulas are carefully explained. In Chapter II there is a good discussion of class limits;

a matter which is too frequently given little or no explanation. An unusually fine assortment of practical exercises and problems is to be found at the end of each chapter, and by their use the authors have avoided the criticism that problems often do not make sense and have no point except to serve as drill for a particular process. Eighty-five charts and tables not only provide an abundance of material for illustration but enable the student to get needed practice in their interpretation.

Although any student just beginning his statistics would welcome the simplicity with which most concepts are explained, it is probable that the chapters on correlation and reliability will be difficult. However, no one should look for a book on "Statistics Self-taught in Ten Easy Lessons." More interpretation of r—high, low, spurious, and co-variation—might well have been given. The inclusion of several critical ratio tables for standard and probable errors would have made the discussion of significance more interesting and helpful. Sampling, although far from ignored, could have received greater stress, for statistical manipulation cannot be expected to make up for bad sampling. This book should contribute much toward a successful course in statistics.

Martin F. Fritz

Iowa State College

Graphic Presentation, by Willard C. Brinton. New York: Brinton Associates. 1939. 512 pp. $5.00.

This new volume is not a revised edition of Mr. Brinton's first book on graphic methods. The latter was a textbook on methodology, whereas this is rather a book of examples with little or, at times, no attempt to explain the construction of the charts. The book is amazing in its scope. It contains examples, seemingly, of almost every type of chart that is used in fields of analysis ranging from science to sports. There are examples of charts taken from complex presentations which only experts may understand (and which are not well explained in the book) to hilarious cartoons from the *New Yorker*. The large number of charts is impressive, and because of this the book may prove to be a helpful guide in solving individual problems of graphics. Many of the charts are in color.

There are a few chapters dealing almost exclusively with methods of presentation, generally for some important topic, such as time series, but on the whole the book seems less effective than Mr. Brinton's earlier work.

Morton S. Nagelberg

Columbia University

Research and Statistical Methodology: Books and Reviews, 1933–1938, by Oscar Krisen Buros, Editor. New Brunswick, New Jersey: Rutgers University Press. 1938. vi, 100 pp. $1.25.

On the assumption that book reviews are a sensitive guide to new proce-

dure in research and methodology, the editor of this book has collected various reviews classified under 47 topics. The purpose, in addition to an emphasis upon new research methods, is to make accessible critical analyses of these methods by excerpting evaluative statements of different reviews. My reaction to this double purpose is that neither is achieved. The reviews are too brief to indicate what the new methods are or their precise worth. In general this collection is another proof that book reviews are not a good index of quality in scholarship or research. Moreover, it contains many an eloquent illustration of the hackneyed style of the typical book review and of the fact that more often than not the author rather than his book is the subject under review.

HAROLD A. PHELPS

University of Pittsburgh

Statistical Testing of Business-Cycle Theories, Volume II: Business Cycles in the United States of America 1919–1932, by J. Tinbergen. Geneva: League of Nations. New York: Columbia University Press. 1939. 244 pp. $1.25.

This volume is the third of a series published by the League of Nations presenting the results of an investigation of business cycles. The first volume, written by Gottfried von Haberler under the title *Prosperity and Depression*, was a theoretical analysis of cyclical variations. Originally published in 1937, a thoroughly revised edition became available about the middle of 1939. The second instalment in the series, an exposition by Tinbergen of the statistical methods intended to be used in later analysis, was reviewed in this JOURNAL in December last year. The methods are a specialized use of multiple correlation. They are applied in the work under review to annual data for the United States, usually for the period 1919–32. No separate variable is used to represent "the cycle." The basic postulate of the study is a system of interrelations among variables that compel cyclical changes. The method, therefore, differs diametrically from an analysis of types of changes within single series.

Tinbergen's study is important primarily because it represents one of the first attempts to construct a nearly complete system of equations to describe cyclical relationships. These relationships are subdivided into four types: definitional relations, demand equations, supply equations, and income formation equations. In contrast with literary analysis, Tinbergen uses a language of symbol and equation to express more exactly, although with less elaboration, the strength of factors causing fluctuations. The nonstatistical reader will have difficulty in "decoding" the mathematical expressions, but he may readily follow the statement of objectives in the introduction as well as the conclusions on business-cycle theories.

Assumptions underlying the mathematical sections need to be investigated in an appraisal of the work. Whereas Tinbergen points to the difficulty of providing by pure reasoning alone any theory of business cycles

without knowledge of the numerical value of coefficients in "mental" equations, so also the form and accuracy of mathematical equations are open to question. The weakness of annual data (partly unavoidable) in the study of short-term lags must be recognized. A fractional-period lag in an irregular cycle may appear in the calculations as a disturbing factor and thereby may reduce the correlation. Linearity underlying the equations is not always in accord with the facts. The equations measure the force of continuing influences rather than of intermittent influences such as currency hoarding. A correlative consideration is the deficiency of the equations in reflecting the effects of new combinations of circumstances. Forces are assumed to operate uniformly throughout the period. Stabilization envisaged merely as the result of a change in coefficients neglects the probability that such modification would change the relationships assumed in the equations. These problems may not be solved by nonmathematical procedures. It is true also that they are an obstacle to mathematical buttressing of economic theory, although the equations despite their imperfections may yield substantial evidence.

Among the conclusions of the study, those of special interest are that influences in the field of money do not obstruct to any great extent the working of other factors, that the acceleration principle applied to investment goods is not of much direct influence on short-term cyclical fluctuations, that the element of changing costs of production does not upset equilibrium markedly except in time of rapid changes such as 1920, that harvest fluctuations work partly positively and partly negatively, that a depression may be the consequence of a preceding boom, and that an automatic revival may be expected for short waves.

Wilbert G. Fritz

University of Pittsburgh

Report of the Fifth Annual Research Conference on Economics and Statistics Held at Colorado Springs, Cowles Commission for Research in Economics July 3 to 28, 1939. Chicago: University of Chicago. 1939. 93 pp.

This volume contains abstracts of the thirty-eight conference lectures given at the fifth annual research conference under the auspices of the Cowles Commission at Colorado Springs during July of 1939. As in former years the scope of the research presented in these lectures was extremely broad and variable in the level of difficulty and abstraction attained. Although the major emphasis was upon the mathematical treatment of theoretical and statistical problems, rather more of the lecturers than formerly confined themselves to non-mathematical exposition. This increases the readability of this report if not the significance of the findings. Probably fewer and more complete abstracts would have been desirable as the reader may find difficulty in evaluating the summaries of the more complex mathematical methods employed and results reached.

Nine of the papers dealt with the application of mathematical methods to theoretical problems, such as the explanation of variance in time series analysis, handling of dynamic elements in a simplified economic system, the dynamic theory of production, and the study of the demand function from market budget and income data. In the field of statistical theory new techniques for fitting straight lines to observed data, modified application of index number construction to stock prices, and the use of the Fourier Series in the analysis of seasonal variation were noteworthy. Papers of a non-mathematical sort dealt with economic conditions in the southern states, international price comparisons, durable goods prices, public spending, tax shifting, forecasting prices, secular growth, and the business cycle. These abstracts were comments on economic problems rather than full expositions, and in some cases their publication in abbreviated form seems hardly worth while. This review will be confined to a few of the technical papers presented.

Harold T. Davis discussed the problem of breaking down a total variance in a time series into its constituents, namely, trend, cycle, disruptive or inflation, and erratic variances. Total variance is greater in economies that appear to have reached the upper asymptote of their growth. Cycle and disruptive variances are most important in price as contrasted with production series. The concept of resonance as defined for mechanical systems was carried over into economics to explain the evidence of disruptive influences in price series. This would seem to be an overly complex approach to a simple problem.

Charles F. Roos emphasized, in dealing with durable goods demand, that while mathematical demand functions cannot explain the underlying causes of cyclical swings they do illustrate how small cycles in the independent variables, income and price, cause large swings in sales. The heart of the business cycle problem is that of explaining changes in consumers' goods orders.

Francis W. Dresch presented a model of a simplified economic system based on the usual general equilibrium concepts with the demand functions for capital, labor, and consumers' goods appended as three additional equations. The dynamic feature was introduced by considering the demand and supply of fixed capital as derivatives with respect to time.

An extension of the purchasing power parity type of analysis was suggested by Morris E. Gurnsey with cost of living indexes and indexes of various other price series, such as industrial and agricultural prices, substituted for the general price level to show the degree of partial disequilibrium engendered within the price structure by changes in the exchange rates.

In a paper on *Competitive Norms in Durable Goods Industries* Theodore O. Yntema stressed the difficulty of reaching objective standards of competitive behavior that would hold over the course of the business cycle. Incremental costs remain fairly constant over a substantial range of output and are below average costs until near capacity output is reached whereas demand functions are subject to great cyclical fluctuations. If perfect price

competition prevailed, producers would be operating at heavy losses except at the peak of the boom.

In *Statistical Testing of Dynamic Systems if the Series Observed are Shock Cumulants,* Trygve Haavelmo concluded that a curve fit by least squares methods is not appropriate if the variable in question is subject to a series of shocks as the constants in the equation cannot be computed with assurance of reliability. More elaboration of the mathematics in this abstract would have been helpful.

Mordecai Ezekiel discussed efforts being made to prove the theoretical formulation of Keynes regarding saving, investment, and the propensity to consume and of Chamberlin regarding the pervasiveness of monopolistic competition.

Geoffrey Shepherd, in a paper on *Demand Curves: Elasticity, Shifts, Rotation, Shape* suggested that causes of changes in demand be subdivided into general and specific changes or changes affecting all commodities and changes affecting particular commodities respectively. This classification enables us to consider both vertical (monetary) and horizontal (real) changes in total demand; the older technique (that of Schultz) lumped these two causal forces together to remove the changes in demand to arrive at the static demand curve of equilibrium theory. Specific changes in demand may be studied by the suggested method without reference to any general deflator, which, being based on trend analysis, may involve us in errors for the short period.

Other papers of importance were *Some Remarks on the Dynamic Theory of Production* by Gerhard Tintner; *On the Measurement of the Degree of Inequality of Income Distributions* by Horst Mendershausen; and *Sources of Demand Analysis, Market, Budget, and Income Data* by Jakob Marschak.

There is a misplaced bracket which the reader will easily detect in the formula for S^2 in the middle of page 27.

O. J. McDiarmid

Carnegie Institute of Technology

The Influence of Prices on Exports. The Hague: Netherlands Central Statistical Office. June 1939. 48 pp. Fl. 0.60. (In Dutch with English Summary.)

This study, published under the auspices of the Netherlands' Government Bureau of Statistics and under the direction of Professor J. Tinbergen, was presented this summer by its co-author Dr. J. B. D. Derksen, Assistant Head of the Division of Business Cycle Research of the above Bureau, before the annual Cowles Research Conference on Economics and Statistics, held at Colorado Springs. The study represents an effort to measure statistically the elasticity of the exports of certain specific commodities from the Netherlands in relation to price changes of those commodities, analyzed with regard to the competitive effects of such price changes on the sales of

those commodities from the Netherlands in some specific export markets as compared with the sales of the same kind of commodities from other countries in the same export markets. The practical purposes of measuring this export elasticity for a government agency like the above are summed up in the following words:

"For the Netherlands, and for many other countries too, the fluctuations of exports are an important factor in the fluctuations of general prosperity. A better quantitative knowledge of the factors causing these export fluctuations is therefore useful for the various problems of business-cycle policy. Such questions as e.g.—What is the effect of a given reduction in wage rates on exports?—or—What is the effect of a given rate of depreciation of the currency on exports?—cannot be answered without a quantitative knowledge of the influence of prices on exports."

The period of analysis, though differing for the various export products, lies between the years 1921 and 1938. In order to abstract from cyclical influences, changes in national income and the effects of economic policies of the various countries constituting the export markets, the authors have computed ratios between imports from the Netherlands and competing imports from other countries into the same markets under the assumption that a number of the above factors which have influenced imports from the Netherlands have equally influenced those from the other countries.

Two kinds of elasticity coefficients form the basis of the analysis: an elasticity of substitution and an elasticity of competition, the elasticity of substitution indicating the percentage change in the proportion imports from the Netherlands/imports from other countries for a 1% change in the ratio Netherlands' Price/competing price, the elasticity of competition indicating the percentage change in the proportion imports from the Netherlands/all imports for a 1% change in the same price ratio.

The results of the investigation show low elasticities of substitution from which the conclusion is drawn that the imperfections in the markets for those export commodities must be considerable. It is inferred as a conclusion for practical economic policy that the stimulating consequences of price reductions for fostering exports must not be exaggerated.

CAREL JAN SMIT

Holland, Michigan

Die Schalthebel der Konjunktur, by Paul Binder. Munich and Berlin: R. Oldenbourg. 1939. 106 pp. Rm. 4.80.

This book is merely the first chapter of a larger volume that the author has planned on the business cycle. In this first chapter he deals with the changes in production and employment which result from an expansion or contraction in the circulation of money and credit. I could not detect any new thoughts that the author has added to our knowledge. The understand-

ing of his ideas and of his discussion is, at times, made very difficult because of the cumbersome and unwieldy language which he uses and because of various neo-German expressions which are so frequent in present-day German literature on economic problems.

Otto Nathan

New York University

World Economic Survey, Eighth Year, 1938–39. 247 pp. $1.50.
World Production and Prices, 1938–39. 113 pp. $1.25.
Geneva: League of Nations. New York: Columbia University Press. 1939.

Economists who are interested in what happens beyond the borders of the United States have come to look forward eagerly to the annual surveys prepared under the direction of A. Loveday. Such economists realize that, until recently at least, what has happened in this country during the past decade cannot be divorced from what has occurred in other countries throughout the world.

Those who argue that it is in the United States alone that government spending has reached high totals, bringing an unbalanced budget, should profit greatly from a perusal of these pages. Pouring out large sums on public works, for example, has not been a peculiarly American device for restoring high business activity and employment. This survey again reveals how other peoples have also come to expect their governments to cure the effects of depressions through drastic measures.

Beginning with a review of the depression of 1937 and 1938, the survey ranges through questions dealing with public finance, national income, money and capital markets, production and prices, employment, wages, standards of living, population, migration, international trade, foreign exchange, and commercial policy—a truly comprehensive picture. It closes with a discussion of the economic effects of war, rearmament, and territorial changes.

Probably the most important fact revealed in these two volumes is this: Formerly, it was possible to speak of the world as an economic unit, with booms and depressions as essentially international phenomena. We could speak of *world* averages of trade, production, and employment. This is no longer true—developments in individual countries are now less dependent upon developments in others. The *world* economy is breaking up into several independent blocs, which more and more are going their own independent economic ways. For example, Germany, Japan, Poland, Finland, and Esthonia did not share at all in the depression of 1937. Italy felt it late in 1938. Other countries felt it in varying degrees (see chart on page 109 of the *World Economic Survey*). The decline was greatest in the United States where it seems to have originated, and its chief impact elsewhere was upon those countries furnishing raw materials to this nation.

The reasons given for the disappearance of a unified world economy are listed as follows: the breakdown of the international gold standard (since a common monetary system is essential to a common economic system), exchange control, restrictions on capital exports, import quotas, and other restrictions on the free flow of goods and capital. The free play of an international price system no longer exists.

Exports and imports have failed to keep pace with growth in production. The disappearance of the gold standard made it possible to attempt "to control the business cycle on a national scale by means such as public works financed by loans, long-term balancing of the budget, easy money, open market operations, regulation of agricultural production, prices, and trade." (*World Production and Prices*, p. 11.) These measures increased the part played by governments in economic life, and the armament boom emphasized this development still further.

Political motives have come to play an ever-increasing part in the movement of economic forces. As long as these motives operate, disparity in economic trends between nations is certain to continue. More and more, the totalitarian states are charting a separate economic course of their own.

These volumes were published just before war began in September, 1939, but all through their pages even a casual reader will see unfolding the transition to a war economy.

CHARLES S. TIPPETTS

University of Pittsburgh

Philadelphia Labor Market Studies (In One Volume).

"The Labor Force of the Philadelphia Radio Industry in 1936," by Gladys L. Palmer and Ada M. Stoflet. April 1938. xiv, 102 pp.

"Ten Years of Work Experience of Philadelphia Weavers and Loom Fixers," by Gladys L. Palmer. July 1938. xiv, 100 pp.

"Ten Years of Work Experience of Philadelphia Machinists," by Helen Herrmann. September 1938. xiv, 132 pp.

"Reemployment of Philadelphia Hosiery Workers after Shutdowns in 1933–34," by Gladys L. Palmer and Constance Williams. January 1939. xiv, 100 pp.

Philadelphia: Works Progress Administration, National Research Project, in co-operation with Industrial Research Department, University of Pennsylvania.

Written in the formal style and objective tone which we have a right to expect from government reports, this volume of WPA studies of the Philadelphia labor market has both the advantages and limitations of detailed statistical studies in the labor field. They present accurately certain facts about a small section of the labor market. But they leave to the reader and to more general types of investigation most of the analysis and interpretation necessary for understanding and controlling the forces at work.

Among the conclusions for which these studies provide evidence are the following:

(1) Employees of new and growing industries (e.g., radio manufacturing) are on the average younger than the workers in older and declining industries (weaving).

(2) Women and young people form a higher proportion of the semi-skilled workers (radio and hosiery) than of the skilled workers (weavers, loom fixers, machinists).

(3) Age, at least up to 65, is not a handicap in holding a job for certain skilled trades (weavers, loom fixers, machinists), but it is a handicap in getting a new job after a period of unemployment.

(4) Of those who change occupations, over one-half transfer to a line requiring about the same grade of skill; but of those who change the grade of skill a majority step down to a lower grade or from "nonproductive" work (clerical and sales) to "productive" (manual) work.

(5) Skilled workers and women workers who transfer from one industry to another are considerably less likely than unskilled and semi-skilled men to have been unemployed immediately preceding the transfer.

(6) Workers who suffer more frequently from unemployment also are unemployed for longer periods on the average than workers who are less frequently unemployed.

(7) Some skilled workers (machinists) have been in good demand throughout the 10-year period (1926–1936). In general the skilled workers suffer less from unemployment than unskilled workers.

(8) Technological changes were not a significant factor in unemployment, except for the weavers. Even for these a secular change in consumer demand and the general business depression were fully as important as the technological changes.

(9) Unionization of labor tends to bring about the substitution of alternate periods of full-time and part-time work in place of alternate rush periods and lay-offs.

(10) Women tend to form a non-competing group relative to men, but they frequently work at the same general type of occupation (e.g., "inspectors").

About one-half of the volume is given over to appendixes of statistical tables and definitions of terms. In addition charts and pictures are scattered liberally through the text of each study.

V. O. Watts

Los Angeles Chamber of Commerce

Trends in Size and Production of the Aggregate Farm Enterprise, 1909–36, by Raymond G. Bressler, Jr. and John A. Hopkins. July 1938. xvi, 255 pp.

Trends in Employment in Agriculture, 1909–36, by Eldon E. Shaw and John A. Hopkins. November 1938. xvi, 163 pp.

Philadelphia: Works Progress Administration, National Research Project.

These companion reports are part of the National Research Project of the Works Progress Administration. Jointly they attempt to measure:

(a) changes in the size and productivity of the total of all agriculture in the United States.

(b) the changes in effectiveness of agricultural labor in the United States.

The first purpose has been accomplished through the construction of two weighted aggregative-type indexes with labor requirements in a base period (1924–1929) used as the weights. One of these indexes purports to measure the changes in the size of the total farm enterprise for the United States as a whole and then for each of the eleven special type farming districts in the United States. Size is defined by this index to mean not merely acreage extent of land devoted to crops but acreage extent devoted to various crops weighted by the labor requirements on each of these crops in the base period, together with the number of animals in the agricultural economy, weighted by the base period labor requirements in the care of such animals. Aggregative production of farm products is expressed in much the same way; that is, the quantities of the different products produced each year are multiplied by the respective number of hours required per unit in their production in the base period. The products are then added for each year and the annual sums are expressed as percentages of the annual average of the sums for the base period.

The size of the aggregate farm enterprise measured in this way is shown to have been increased from an average of 89 in 1909 (1924–1929 = 100) to 102 in 1930. Subsequently it decreased to a low point of 91 in 1934 and stood at 94 in 1936. Only four of the eleven areas were as high in 1936 as in the base period.

These were:

Corn Area	101
Western Dairy Area	103
Pacific Northwest	110
California	117

The index of agricultural production for the United States shows the same general trend with somewhat greater annual fluctuations than that reported for the size of aggregate farm enterprise. The total production index increased from 80 in 1909 to 109 in 1931. It subsequently decreased to 82 in 1934 and stood at 90 in 1936. Four areas showed a higher index in 1936 than for the base period. These were:

Eastern Cotton Area	105
Delta Cotton Area	113

Pacific Northwest	114
California	129

It is significant to note that three areas showed a larger aggregate farm enterprise in 1909 than in the base period; namely,

Eastern Cotton Area	105
Corn Area	108
Eastern Dairy Area	113

In contrast, four areas showed less than 80 per cent of their base period development in 1909; namely,

Pacific Northwest	77
Western Cotton Area	73
California	67
Range Area	66

These data indicate with some precision the obvious fact of differences in maturity of various agricultural regions during the period studied.

The second of the two studies purports to show the changes in agricultural employment from 1909–1936. The authors say, "It is believed that the figures presented provide a reasonable and fairly reliable measure of the changes in agriculture since 1909. Although they are the best estimates which it is possible to make with available data, they should be regarded only as approximations to be improved as additional facts become known." Data are presented for the United States as a whole and for ten of the eleven regions used in the other study, California being incomplete. It is found that the total agricultural employment for the United States decreased from a little over twelve million in 1909 to approximately eleven million in 1936. The great majority of these are family workers. The hired workers have decreased from about 2½ million in 1909 to 2¼ million in 1936.

The data in this report are combined with the indexes of size of enterprise and total production given in the other report. This comparison permits an estimate of the production per worker. An index is reported which shows that individual productivity increased from an index of 75 in 1909 to 105 in 1932 and subsequently fell to 93 in 1936. In other words, individual productivity in agriculture increased 40 per cent between 1909 and 1932, but in 1936 stood only 25 per cent above the 1909 level. Productivity per worker was very low in 1909 relative to the base period in the Western Cotton Area, the Range Area, and the Pacific Northwest; it continued to increase after the base period only in the Eastern and Delta Cotton Areas and in the Pacific Northwest.

These reports furnish a picture of the trends in agricultural production that is more precise and convincing than anything previously available. Increases in individual productivity are shown to be important, but not nearly so large as those that have occurred in the manufacturing industries Moreover, there is a strong suggestion in the data that both the size of the

total agricultural enterprise and the productivity per worker have reached a temporary maximum.

The methods used in the construction of weighted indexes appear to be sound and consequently, the conclusion to be drawn from the summarized data are as satisfactory as can be expected from the original source material. There are some important limitations in the original statistical series, but these are clearly enumerated in the reports. Consequently, the reader or worker in the field is forewarned concerning the shortcomings from that source.

ROLAND S. VAILE

University of Minnesota

Wheat Studies of the Food Research Institute. Stanford University, California

"World Wheat Survey and Outlook January 1939," by Helen C. Farnsworth and Holbrook Working. Volume XV, Number 5. January 1939. pp. 259–96. $0.75.

"Seasonal Aspects of the European Wheat Trade," by M. K. Bennett. Volume XV, Number 6. March 1939. pp. 297–335. $0.75.

"Durum Wheats and their Utilization," by Carl L. Alsberg. Volume XV, Number 7. April 1939. pp. 337–64. $0.75.

"World Wheat Survey and Outlook May 1939." by V. P. Timoshenko and Holbrook Working. Volume XV, Number 8. May 1939. pp. 365–400. $0.75.

The Wheat Studies surveys of the world wheat situation contain their usual full and informative review of production, carryovers, price movements, margins and exports. The other studies are monographs on two entirely different but quite interesting aspects of the Wheat Market.

Mr. Bennett's study covering what now we know to be the period between the first and second world wars, divides the wheat exporting year into three periods, August–December, January–April, May–July. In the first of these periods Europe receives 42% of wheat imports, 32% in the second and 26% in the third. Because of variations in crops, shipping conditions and location of supply, no single year has adhered to the general average nor have any two years followed closely parallel courses. However, certain generalizations can be made. For example, the relationship of the August–December shipments to the total amount shipped during the year depends on: 1) the "spread between the December and March futures at Liverpool" in the fall and 2) the margin between exports available and European import requirements.

A March future high above the December tends to enlarge the proportion of fall shipments to the total, a large margin of export supplies above import requirements also tends to enlarge fall shipments. Once the margin between export supplies and import requirements is 250,000,000 bushels, an increase

in its size has no further influence on the proportion of wheat shipped during the fall. However, this formula seems to hold with any assurance only for "normal" years, as there have been so many unusual years in the wheat trade that the scatter about the line (Chart 10) drawn to show the relationship between the size of fall shipments and the export margin is quite wide.

As between winter and spring shipments there appears to be no consistent relationship. Certain years, 1924–25, 1926–27, 1936–37 show very low spring shipments in comparison with winter exports and these seasons show common characteristics like small export margins, unusually large import requirements and ordinary "but not superabundant crops" in the southern hemisphere. Beyond this, however, hardly any general statement regarding the rates of shipment in the winter and spring is possible.

Whereas the nature of Mr. Bennett's study was analytical, Mr. Alsberg's is descriptive. We learn that *triticum durum* is distinguished from common wheat (*triticum vulgare*) by creamy color and greater hardness, which makes it highly suitable for the manufacture of macaroni, and that it makes a heavier dough and requires less water than flour made of ordinary wheat. Because durum is resistant to rust and yields well in arid territories it is grown extensively in the countries of the Mediterranean Basin, in Southern Russia, in India and in the western plains of the United States and Canada. "Under certain climatic conditions," in fact, durum will give a higher yield than any variety of common wheat.

In a favorable environment durum will contain more protein than any other wheat, and because protein is ordinarily expensive, products made of semolina may be of great significance in the diets of nations with low incomes. In this connection, it is interesting to note that as knowledge of milling techniques has improved, more and more durum has been blended with ordinary wheat in making bread flour.

These studies are worthy additions to the already long list of valuable contributions that the Food Research Institute has made to our knowledge of the Wheat Situation.

THEODORE NORMAN

United States Department of Agriculture

On Agricultural Policy, 1926–1938, by Joseph S. Davis. Stanford University, California: Food Research Institute. 1939. viii, 494 pp. $3.00.

This book consists of selections from the author's writings of the last dozen years. As is indicated in the foreword, Dr. Davis has despaired of finding time to write a systematic treatise on agricultural policy. Nevertheless the writings cover so wide a scope and have been so edited and organized that the book seems to provide a quite satisfactory presentation of his views on the subject. Furthermore, since some of the chapters were written more than a decade before others, and since revisions which reflect changes in

opinion have been avoided, the book has an interest and serves a purpose which a systematic treatise would not.

As is inevitable in a compilation of this character, there is considerable reiteration of some viewpoints, opinions, and arguments. However, either through skilful editing or because of the freshness of mind with which the author approached each successive effort, these repetitions do not prove burdensome to the reader. Instead the differences in setting or in emphasis often increase rather than detract from the interest.

The first four chapters comprise a section entitled "Perspectives." They are dated at various times from July 1932 to December 1936. With three exceptions, the remaining 29 chapters appear in the chronological order in which they were written—Chapter V, entitled "The Agricultural Problem in the United States," being dated October 1926; and Chapter XXXIII, "The Drift of Agricultural Policy," being dated November 1938. These last 29 chapters are grouped into six sections as follows:

Problems and Proposals, 1926–1929
Under the Farm Board, 1929–1930
In Extreme Depression, 1931–1933
Official Agricultural Adjustment, 1933–1935
Appraisal of American Programs, 1934–1936
Broad Drifts in Policy, 1937–1938.

The book as a whole may be characterized by a single word—critical. It would be impossible to examine intelligently the philosophies, proposals, and programs relating to agricultural policy without being critical of the majority of things which have been said, written, and done. And Dr. Davis is no mean critic! His analyses are penetrating, and his exposition of them is clear-cut and readable. Though he does not hesitate to criticize where he deems criticism to be warranted, he is nevertheless cautious in arriving at conclusions, and his writings are characterized by their dignity and restraint.

The reader first obtains a general view of Dr. Davis' opinions on agricultural policy in the second chapter, "Agricultural Fundamentalism." Although the term is nowhere specifically defined, the author apparently considers it a

"... conviction that agriculture is par excellence the fundamental industry, and that farmers are, in a peculiar sense and degree, of basic importance in society." (p. 26, September 1934.)

Two central points are made in opposition to the doctrine:

"... *economic progress, broadly viewed, tends to be accompanied by a decline in the relative importance of agriculture.*" (p. 27, September 1934.)

"Agriculture, moreover, is by no means uniquely essential." (p. 32, September 1934.)

In concluding the chapter the author states:

"I challenge the soundness of agricultural fundamentalism, not because

there is no truth in it, but because it contains so much of error as to lead the world astray." (p. 43, September 1934.)

Dr. Davis' criticism of the various points of the doctrine which he takes up is certainly incisive and penetrating. But to the reviewer it seems that in the enthusiasm of his attack on various fallacious arguments, Dr. Davis has failed to give due credit to a fundamental truth behind the whole doctrine.

In my opinion, what is really back of "agricultural fundamentalism" is the conviction that when agriculture generally is suffering severe economic distress, and yet is continuing to produce undiminished quantities of goods which are primary necessities of human well-being, there is something wrong with the operation of our economy. This truth Dr. Davis recognizes, for he states:

"We are right in believing that conditions are wrong when the typical or average farmer is unprosperous." (p. 86, August 1927.)

But he places the primary blame on overproduction in agriculture, and in large measure this overproduction is viewed as one of the natural concomitants of economic progress, thus:

"In default of better indicators, it is unsafe to ignore the harsh economic touchstone, that persistently low remuneration for a group tends to mean that society as it is does not want so many of that kind." (p. 210, November 1932.)

"One of the harsh facts of these postwar years is that this country, and the world at large, needs fewer farmers than there tend to be. Increased efficiency in farming here and abroad, reduced per capita utilization of important farm staples such as wheat and horses, greater attractions in farm life accompanying the democratization of the telephone, the automobile, the tractor, the radio, and electricity: these are among the factors responsible for the much-discussed agricultural surpluses and the matter of 'surplus farmers' which is usually too delicate to discuss." (p. 427, July 1938.)

Consistent with his views as to the causes of agricultural distress the author opposes the various price-raising measures which have been proposed, on the grounds that:

" . . . various steps to increase farm prices and per capita farmer income would not have improved the balance, but would have made it worse by stimulating increases in the number of farmers and their volume of output." (p. 209, November 1932.)

Although it is recognized that the two postwar depressions "fell with extreme severity on the farmers" (p. 435), one finds little to suggest that a fundamental cause of agricultural distress may have been improper functioning of other parts of our economy. However, in November 1932 it is admitted parenthetically that obstacles to the ready movement of the farm population into other occupations have contributed to there being too many people on farms (p. 209). As time passed the author apparently recognized

that such obstacles had a greater importance, for under date of July 1938 we find the following:

"... If the condition [unemployment] persists, however, it means that individual initiative is sadly lacking or that barriers are obstructing the absorption of workers in old or new lines. The existence of such barriers is undeniable; and their removal is of vital importance for the satisfactory functioning of our society, and in particular for the solution of agricultural problems." (pp. 428–29.)

To deal with the agricultural distress of the last two decades as primarily the result of agricultural overproduction is to fail to see the deeper significance of the situation. Prices of farm products may decline either because of an increase in production or because of a decrease of demand. A decline in industrial production decreases the demand for agricultural products. During the present century severe and general agricultural distress has existed in this country only at times of sharply restricted industrial production. Is it not likely, then, that these spasms of underproduction of other industries were an important direct cause of the acute agricultural distress during the early 1920's and the early 1930's?

Not only the severe depressions, but also the agricultural *malaise* of the intervening and subsequent years has been ominously symptomatic of a fundamental incompatability in our economic arrangements. Where there is so much of imperfect competition and price rigidity as exists in non-agricultural industries, Dr. Davis' "economic touchstone" is an unsafe guide to agricultural policy.

I question in particular Dr. Davis' contention that agricultural price-raising measures such as the Export Debenture Plan would have significantly increased the total volume of agricultural production. People did not remain in agriculture because hourly returns in that industry were attractive. They stayed in, rather, because there were not adequate opportunities for employment in other, better paid, industries. Where high wage rates and commodity prices in other industries were maintained through restriction of competition, this very maintenance reduced the opportunity to shift occupations instead of providing an effective incentive for such a shift. If wages and prices in such industries had been lower, then there would have been opportunity for more employment in them. Conversely, if prices and returns to those employed in agriculture and in other industries whose prices were flexible and subject to direct influence from international markets had been increased, this would have tended to restore the balance and to increase production and employment in the rigid-price industries.

The foregoing should not be taken to mean that the reviewer believes that measures designed to increase agricultural prices and money incomes are the most desirable objectives of agricultural policy. Such measures have various disadvantages—among them the maintenance of the entire price structure of the country at artificially high levels in the light of the inter-

national price situation. There are various alternatives, including the introduction of a greater degree of price and wage competition in other industries so that their prices and wages would be more flexible.

Whatever the most desirable procedure in dealing with the problem of economic stability, it is highly essential that we realize the importance of price relationships as causal factors. So long as men refuse to work unless they receive a wage as high as that to which they have become accustomed, so long as factory owners determine the scale of their operations on the basis of the amount which they can sell at a pre-determined price—so long will price relationships be a primary causal factor in determining the scale of economic activity and the welfare, not only of agriculture, but of the economy as a whole.

While I view my point of criticism as fundamental, it is nevertheless debatable. Perhaps the majority of readers will incline to Dr. Davis' view rather than to mine. In any event, *On Agricultural Policy* must be recognized as an outstanding volume. It presents a splendidly critical analysis of a variety of aspects of agricultural policy.

E. J. Working

University of Illinois

German Financial Policies 1932–1939, by Kenyon E. Poole. Cambridge: Harvard University Press. 1939. xiv, 276 pp. $3.50.

The varied relief and recovery measures adopted by successive governments in Germany from 1932 to 1939—running the gamut from the severely deflationary cost reductions and high taxation of the Bruening government to the large volume of deficit spending under Hitler—provide abundant material for examination. Using the German experience during this brief period the author analyzes the comparative effectiveness of tax refunds and public works as economic policies to combat stagnation of private investment and mass unemployment. This analysis is supplemented by a discussion of methods of financing, of banking institutions and their participation in the program, and of the impact on taxation and public debt. Other questions, such as restrictions on international trade, depletion of natural resources and levels of living which have been treated repeatedly in recent economic publications on Germany under National Socialism are mentioned only cursorily.

The test of these economic policies under the laboratory conditions sought by the author is, of course, denied the economist. The German case after 1935 is particularly restricted by the shift from recovery policies to a war economy. Nevertheless, the author's analysis, based upon the German case, but going beyond the experience of that country, leads to the cautious but acceptable conclusion that both tax refunds and public works, if used simultaneously and boldly, may under certain conditions result in increased pri-

vate investment—the author's unstated but implicit criteria of recovery. In this discussion many of the special economic problems concomitant to the broader recovery measures are thrown into relief. Inadequate emphasis, however, on restrictions and controls introduced by the Hitler government in line with its militaristic aims limits the usefulness of the author's interpretation of the German recovery and its applicability to the experience of other countries. Data on prices, production, costs, investments, and money in circulation are compared and interpreted. The author especially stresses the construction industries because of their importance in any public works program. Other industries, such as food, automobiles, textiles, are treated to measure the secondary repercussions and multiplier effects of public works with negative and unsatisfactory results.

The author's straddle between theoretical analysis of economic policies and description of financial institutions often results in only partially convincing theoretical arguments and in incomplete descriptive material. The volume, nevertheless, is interesting and timely. To the many laymen and public officials perplexed about the "miracle" of economic recovery in Germany, the volume presents a useful survey of the mechanisms introduced and of their effects. To the students of the theory of public spending, the volume should be of interest because of the possibility it affords of analyzing an experiment in public spending and of pointing up the limitations of verification of the effects of this program.

S. J. MUSHKIN

Washington, D. C.

Personal Finance Comes of Age, by M. R. Neifeld. New York: Harper & Brothers. 1939. ix, 324 pp. $3.50.

This volume describes a business that lends sums of $300 or less under regulatory small loan statutes. As economist for the Beneficial Management Corporation, operator of the largest chain of licensed small loan offices, and as a competent statistician, Dr. Neifeld is peculiarly qualified to write in this field.

The book bears some resemblance to the author's earlier volume, *The Personal Finance Business* (Harper and Bros., New York, 1933). These volumes cover the same field; are similar in structure; and indicate that the author's point of view has changed but little. The present volume, however, is far more than a revised edition of the earlier one. In addition to completely revising the text, improving the presentation, and bringing up to date the material of his earlier volume, Dr. Neifeld has stocked the present volume with a wealth of new, interesting, and useful information concerning the business he has undertaken to describe.

It has been a common complaint that there is a scarcity of statistical data in the field of consumer credit. While this is certainly true of many sectors

of the field, Dr. Neifeld offers ample evidence that there are few types of business enterprise for which the statistical picture is so comprehensive and detailed as it is for the personal finance business. He has assembled from many sources data concerning the legal status of that business; the volume and outstanding amounts of its loans; its expenses, losses, and profits; its organization with respect to multiple and single-unit enterprises and to trade associations; its financial structure; the incomes, ages, and occupations of its borrowers; and the purpose for which loans are made.

The maturity of the personal finance business is reflected in the author's numerous tables. Rapid secular growth of the business ended in 1930; competition has become severe; rates of charge and profits have been reduced. Also the business has become more truly aware of its social responsibilities.

The principle contribution of *Personal Finance Comes of Age* is the assembly of a remarkable array of pertinent and useful statistical data. But the borrower revealed by his statistical tables lacks the flesh and blood that case studies could give. Dr. Neifeld explains that "the lender must respect the borrower's desire for privacy . . . and is constrained from generalization and theorization by the pressure of practical operation of an intricate business."

With respect to the author's interpretations this reviewer finds himself in disagreement at many points, only two of which can be mentioned here.

Dr. Neifeld finds support for his contention that charges for small loans should be stated in terms of interest and fees in the experience of California, Colorado, Nebraska and Canada which, "through the use of fees and brokerage" have devised "a working arrangement" for meeting the "personal finance needs of the state." But the working arrangement was more satisfactory to the lender than to the borrower. In California, charges for small loans were scandalous, and in Colorado recent litigation indicates true rates of charge about twice as high as those in states which control charges in terms of inclusive percentages on unpaid balances. It is noteworthy that in the Spring of 1939, apparently too late to permit revision of Dr. Neifeld's manuscript, both California and Canada enacted small loan laws containing standard rate sections.

The author asserts that "cash credit agencies do not create the demand to which they cater. That demand arises from the uncontrollable emergencies which beset the worker . . . " It is certainly true that most small loans are made to refund debts already contracted and that the principle effect of small loan advertising is to divert business from competitors. But this reviewer is unconvinced that sugar-coated advertisements and offers of additional cash to present borrowers may not in themselves create demand.

A review for publication in this Journal calls for some comment upon Dr. Neifeld's commendable effort to illuminate his tables "with clumsier and more intelligible headings." But whether comprehension is facilitated by prefixing the queries "how many?" or "how much?" to orthodox table

headings and the phrases "this is how many" or "this is how much" to orthodox column headings appears, on the basis of this experiment, to be rather doubtful.

ROLF NUGENT

Russell Sage Foundation

Credit Unions in Massachusetts, by Joseph L. Snider. Cambridge: Harvard University Press. Publications of the Pollak Foundation for Economic Research, Number 14. 1939. 142 pp. $2.50.

The author of this book is associate professor of business statistics in the Harvard Graduate School of Business Administration. He brings to his task a well-trained mind which is reflected in careful analysis and systematic presentation. His style is interesting, his facts pertinent and illuminating, and his deductions well-founded. The tables, many of them heretofore unrecorded, represent a distinct contribution to credit union study.

The growth of credit unions during the past twenty-five years and their economic and social importance—particularly during the past ten years—have made these institutions a matter of more than casual interest. Although the general public has little knowledge of these co-operative associations, there are 7,000 of them in the United States having a total membership in excess of one million and total assets of 100 million dollars. Much has been written about their activities and the measure of success that they have achieved; in almost every instance the author had preconceived ideas which were based on his personal experience or viewpoint. Such articles, even though they are honestly written, reflect the prejudice of the author. Professor Snider avoided this error. He was under no obligation to prove that credit unions are, or are not, constructive instrumentalities in economic progress. On the contrary, he approached the subject with an open mind and a sincere desire to record the facts as he found them. Always conservative in his expression of opinion, he impresses one with the thoroughness of his study and the correctness of his conclusions, a combination which results in a true appraisal of the possibilities of these institutions.

The subject is covered adequately under five principal headings—(1) Analysis of credit union growth; (2) Experience in four industrial centers; (3) The four major types of credit unions; (4) Credit unions and personal finance companies; and (5) Credit unions and commercial banks, the two latter headings presenting an excellent discussion of small loans as made by credit unions, loan agencies and commercial banks. The history of the movement is traced through the lean years of development from 1910 to 1926; the sudden expansion in numbers and activity from 1926 to 1930; the struggle of young institutions of a comparatively new type through the early years of the business depression; and the substantial growth in recent years.

The first credit union law to be placed upon the statute books in this country was enacted in Massachusetts in 1909. It was an attempt to combat the evils attendant upon the making of small personal loans. Can such evils be minimized best by regulation of the lenders or by education of the borrowers? The credit union is one solution that has been given a trial in Massachusetts. The result of that trial must form a part of any comprehensive study of the credit union movement. For this purpose, there is no work comparable with the broad, impartial and expert analysis and discussion presented by Professor Snider.

William B. Jensen

Massachusetts Banking Department

The Structure and Growth of Residential Neighborhoods in American Cities, by Homer Hoyt. Washington, D. C.: Federal Housing Administration. 1939. vi, 178 pp. $1.50.

The author of this book provides a significant factual analysis of the structure and growth of American cities with emphasis on residential neighborhoods. Based on various Real Property Inventories of 142 cities taken since 1934 and studies undertaken by the Division of Economics and Statistics of the Federal Housing Administration, this book divides into two parts, treating first city structure in its static form, and secondly the dynamics of city growth. As is usual for Federal publications this one seeks to make a practical contribution justifying the expenditure of public funds. It suggests a series of techniques of utility in charting and measuring the components of city structure. It then demonstrates how these techniques reveal these components when applied to a number of cities of varying size. Finally, it develops principles based on the dynamics of structural growth which should serve as a basis for forecasting the economic outlook of specific residential neighborhoods.

Of interest is the use of the city block as the smallest most flexible statistical-cartographic unit for the analysis of city structure. In all, 100,770 blocks were analyzed. Of the voluminous inventory data available, 8 factors selected as particularly significant to the measurement of housing conditions and residential neighborhoods were posted to each city block. These factors concerned: average rental; number, age, state of repair, percentage of commercial use, and nonwhite occupancy of residential structures; the number of owner-occupied dwelling units; and the number of dwelling units without private bath.

The analysis of the distribution of these factors, in revealing the structure of residential neighborhoods, provided a basis for two important generalizations, namely, the representative character of average block rent, and the *sector theory* explaining city structure. Average block rent was found to be representative of a series of other housing factors and could, therefore, in

the absence of such broad basic data, be used as an adequate alternative technique in the analysis of urban areas. Further, that "extremely low rent is usually accompanied by a combination of adverse housing conditions, but the rise in rent from the middle to the upper ranges is not followed by any commensurable improvement in factors that measure the presence or absence of basic modern conveniences. Gradations in rent in the upper ranges measure, in increasing degree, those forces not recorded in real property surveys such as topography, style of architecture, accessibility to schools and shopping centers, the incomes of the residents, the proximity to adverse influences, restrictive covenants, and other features." The sector theory advanced as a refinement to the useful though non-realistic concentric circle theories of R. E. Park and Henry Wright explains that, "rent areas in American cities tend to conform to a pattern of sectors rather than of concentric circles . . . highest rent areas of a city tend to be located in one or more sectors . . . with a gradation of rentals downward . . . in all directions . . . intermediate rental areas . . . adjoin the high rent area on one or more sides, and tend to be located in the same sectors . . . low rent areas occupy other entire sectors of the city from the center to the periphery . . . there is an upward gradation of rents in one or more sectors in which the highest rental area is located, but there are also low rent sectors in which there is no increase in rents as one goes from the center to the periphery of the city."

Through studies of the dynamics of city growth based on census records, U. S. G. S. quadrangles, Sanborn insurance atlases, early city maps, photographs, city histories and newspaper files, building permit age records, real property surveys, and the testimony of old inhabitants, certain facts are determined. The direct correlation between the growth of city population and the area of residential neighborhoods is conclusively demonstrated. The forms of city growth are shown to be: vertical expansion, in areas already settled, through the replacement of single-family by multifamily structures; horizontal expansion filling in the interstices in the existent settled areas; and peripheral expansion, either as axial growth along fast transportation lines or the growth of isolated nuclei later coalescing with the main body of the city. Finally, the pattern of movement followed by high rent neighborhoods provided a practical extension to the sector theory . . . "high grade residential growth tends to proceed from the given point of origin, along established lines of travel or towards other existing nuclei of buildings or trading centers . . . to progress toward high ground which is free from the risk of floods and to spread along lake, bay, river, and ocean fronts, where such water fronts are not used for industry . . . to grow toward the section of the city which has free, open country beyond the edges and away from 'dead end' sections which are limited by natural or artificial barriers to expansion . . . to grow toward the homes of the leaders of the community . . . (to be pulled in the same general direction as the movement of office buildings, banks, and stores) . . . to develop along the fastest existing trans-

portation lines . . . (to continue growth) in the same direction for a long period of time . . . and for de luxe high rent apartment areas (to tend to establish) near the business center in old residential areas."

Notable, likewise, are the 100 or more cartographic illustrations contained in this book, material which represents only a partial selection from the voluminous records prepared by the Division of Economics and Statistics of the Federal Housing Administration. Of particular note are maps showing: land coverage in Emporia, Kansas, by treating each block as a bar graph and showing the proportional area covered by major structures, land in permanent use but without structures, and land not in permanent use; axial and nuclear development of settlement along transportation lines in the Chicago metropolitan area; the coincidence of factors indicative of poor housing in Richmond, Virginia, by means of five transparent overlays; the theoretical sector pattern of distribution of rent areas in 30 cities, supplemented by similar maps for 6 principal cities showing shifts in the location of fashionable residential areas at three periods since 1900; and the growth in the settled areas of New York, Washington, D. C., New Orleans, Boston, Philadelphia, Baltimore, San Francisco, and Kansas City. Students undertaking urban studies in the United States should not fail to investigate the unpublished cartographic and statistical source material prepared by the Division of Economics and Statistics of the Federal Housing Administration, of which that appearing in this volume is only a sample.

Malcolm J. Proudfoot

U. S. Bureau of the Census

Cityward Migration: Swedish Data, by Jane Moore. Chicago, Illinois: University of Chicago Press. 1938. xix, 140 pp. $2.00.

This is an intensive statistical study of phenomena accompanying migration to a metropolitan center, made possible by the figures of the Swedish census of 1930.

The study, using the residents of Stockholm born in the province of Västmanland as a sample, tests two hypotheses:—(1) that in migration within a country, persons will be more likely to migrate to communities similar in degree of industrial development to their birthplaces than to those of different degrees; (2) that the behavior patterns of migrants will reflect the patterns of the communities of their birth.

In testing the first hypothesis, it is found that those born in urban communities are, in proportion to the number of such persons in the population, more likely to migrate to Stockholm than those born in agricultural districts. To eliminate possible effects of distance, the result is checked, and substantiated, by a comparison of migration from communities of similar distances from Stockholm. Those born in towns are more likely to move directly to Stockholm, while those born in agricultural districts are more

likely to reach Stockholm after intermediate moves through less highly urbanized communities.

The second hypothesis is tested by comparing the behavior patterns of migrants from three types of communities, agricultural, rural industrial, and urban, with the patterns of Stockholm-born, in four items, education, occupation, income and marital status. The data show that those born in towns complete more education than those born in the other two types of communities. Those born in urban communities are more numerous in proportion in clerical occupations than those from industrial and agricultural communities, while those from industrial exceed those from agricultural in skilled occupations. Analysis of incomes fails to reveal any consistent differences. The statistics for marital status show that males born in agricultural communities, but resident in Stockholm, tend to marry in greater proportion than those born in the other two types of communities, while the data for females show no consistent results. Thus, in some aspects, the hypothesis that the behavior of migrants still reflects differences correlated with their places of birth is verified.

The work has been painstakingly and scientifically done. The presentation is a model of logical method, with careful statement of each hypothesis, of assumptions and implications involved in each step; and with summaries of each section, and of the completed study, checking the data as found with hypothetical expectations. Care is taken to avoid placing undue reliance upon too small sampling or non-significant differences.

It would have been greatly improved by three features:—first, charts illustrating the relationships shown by the tables and explained in the text; second, the addition to certain of the tables, such as that on page 24, of figures bringing out facts mentioned in the text, but omitted from the tables; third, by clearer wording in the headings of many of the tables.

W. LEWIS ABBOTT

Colorado College